VM
731
B29+
Atlas

NAVAL ENGINES AND MACHINERY

1904

PLATES

JOHN K. BARTON

VM
731
B29+
Atlas

Cornell University Library

BOUGHT WITH THE INCOME
FROM THE
SAGE ENDOWMENT FUND
THE GIFT OF
Henry W. Sage
1891

A. 183515 5/12/1904

The date shows when this volume was taken.

~~AUG 2 6 1996~~

~~NO[illegible] 1999~~

HOME USE RULES.

Books not needed for instruction or research are returnable within 4 weeks.

Volumes of periodicals and of pamphlets are held in the library as much as possible. For special purposes they are given out for a limited time.

Borrowers should not use their library privileges for the benefit of other persons.

Books not needed during recess periods should be returned to the library, or arrangements made for their return during borrower's absence, if wanted.

Books needed by more than one person are held on the reserve list.

Books of special value and gift books, when the giver wishes it, are not allowed to circulate.

VM731 .B29 Cornell University Library
+ Atlas
Naval engines and machinery :
olin 3 1924 030 903 284
Overs

Cornell University Library

The original of this book is in
the Cornell University Library.

There are no known copyright restrictions in
the United States on the use of the text.

http://www.archive.org/details/cu31924030903284

NAVAL ENGINES AND MACHINERY

A TEXT-BOOK FOR THE INSTRUCTION OF MIDSHIPMEN

AT THE

U. S. NAVAL ACADEMY

BY

JOHN K. BARTON
Commander, U. S. Navy
Head of the Department of Marine Engineering and Naval Construction

PLATES

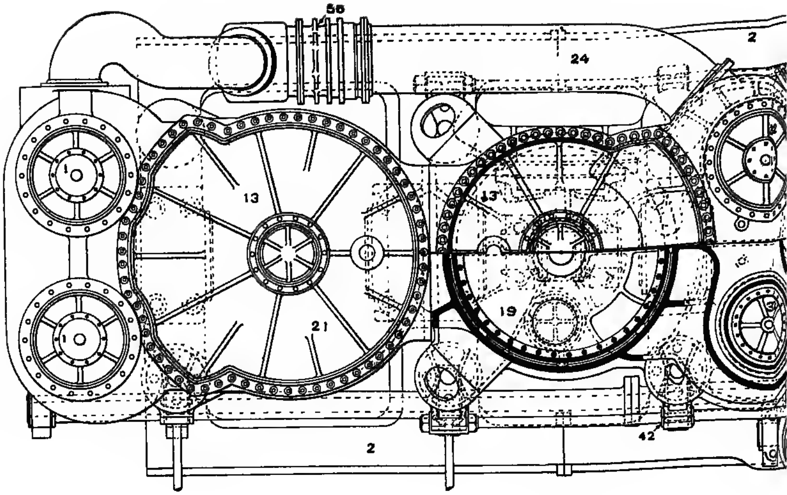
ANNAPOLIS, MD.
THE UNITED STATES NAVAL INSTITUTE
1904

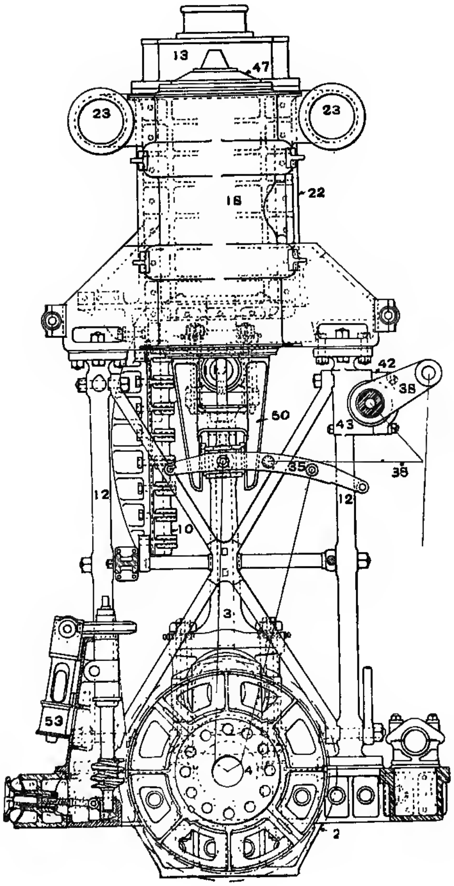
Copyright, 1904, by
PHILIP R. ALGER,
Sec'y and Treas. U. S. Naval Institute

The Lord Baltimore Press
THE FRIEDENWALD COMPANY
BALTIMORE, MD., U. S. A.

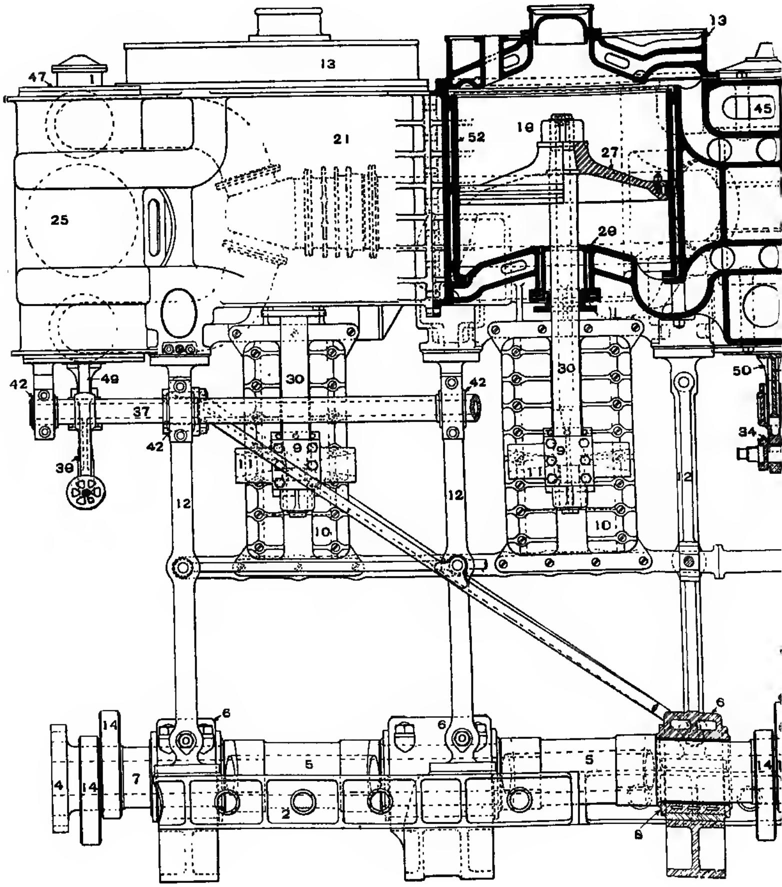
KEY.

1. Balance pistons.
2. Bed plate.
3. Connecting rod.
4. Couplings.
5. Crank pins.
6. Crank shaft bearings.
7. Crank shaft.
8. Crank shaft brasses.
9. Crossheads.
10. Crosshead guides.
11. Crosshead pins.
12. Columns.
13. Cylinder covers.
14. Eccentrics.
15. Eccentric rod, go-ahead.
16. Eccentric rod, astern.
17. Eccentric straps.
18. High-pressure cylinder.
19. Intermediate-pressure cylinder.
20. Forward low-pressure cylinder.
21. After low-pressure cylinder.
22. Main steam.
23. High-pressure exhaust or first receiver.
24. Intermediate-pressure exhaust or second receiver.
25. Low-pressure exhaust.
26. Piston, high-pressure.
27. Piston, intermediate-pressure.
28. Piston, forward low pressure.





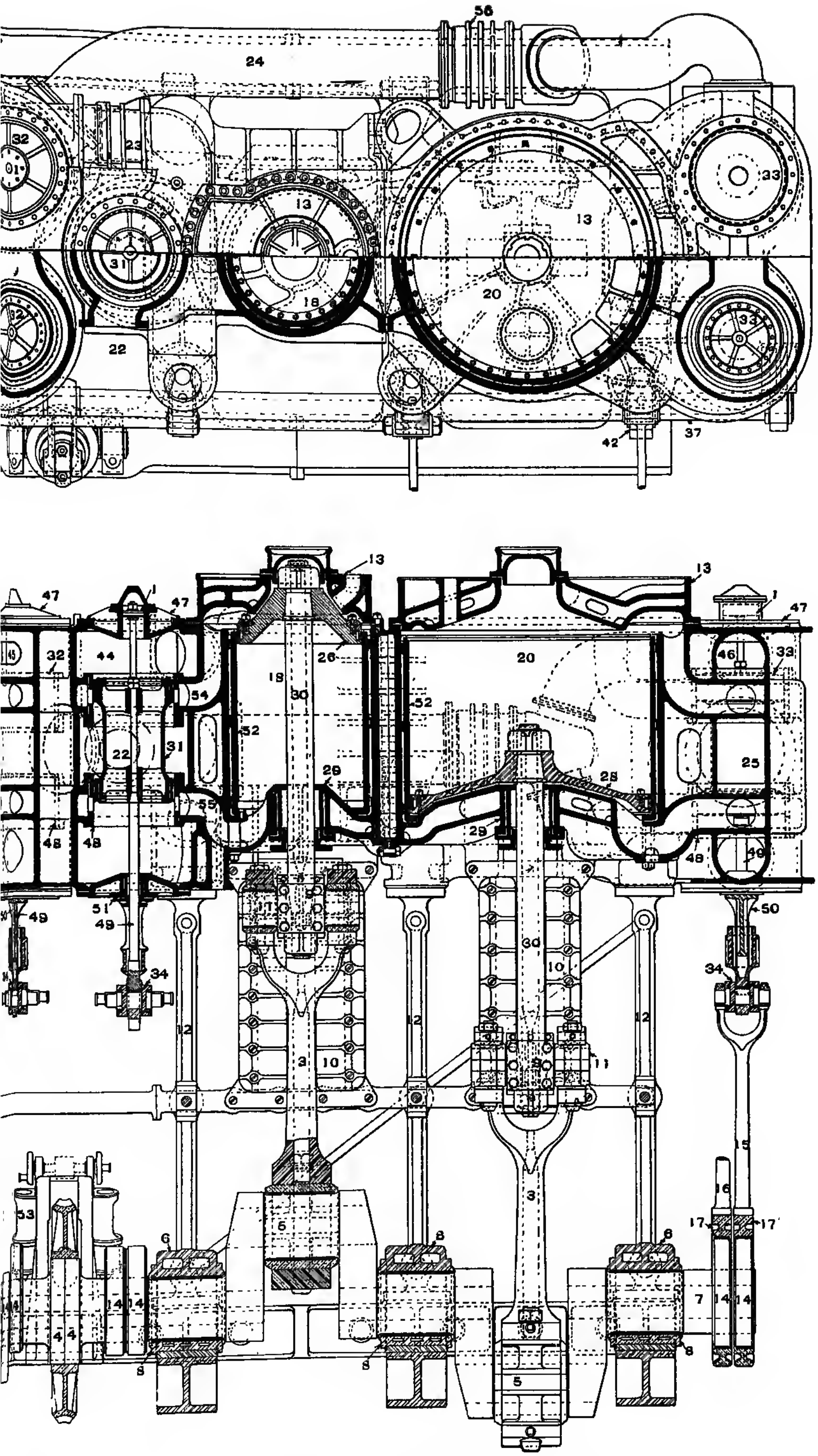
H. P. Cylinder, looking forward.



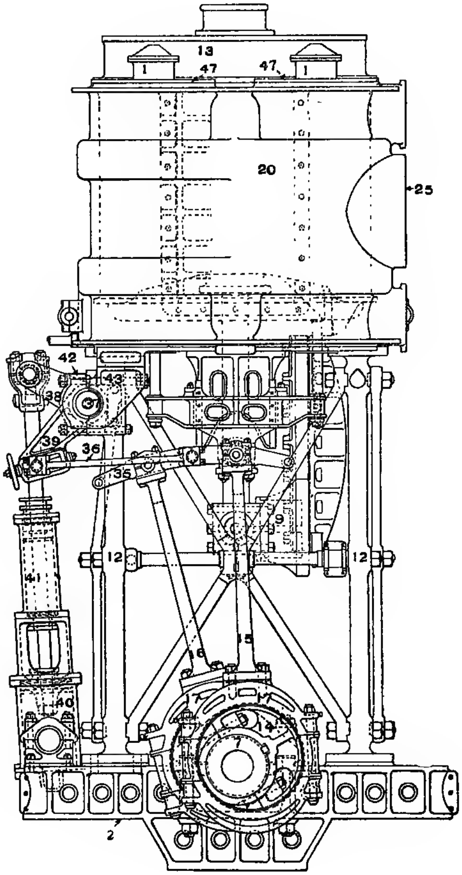
Four Cylinder Inverted, Direct Acting Triple Expansion

KEY.—Continued.

29. Piston rod stuffing boxes.
30. Piston rods.
31. Piston valves, high-pressure.
32. Piston valves, intermediate-pressure.
33. Piston valves, forward low-pressure.
34. Link blocks.
35. Main links.
36. Suspension links.
37. Reversing shaft.
38. Reversing shaft arm for reversing engine.
39. Reversing shaft arm for links.
40. Steam reversing cylinder.
41. Oil controlling cylinder.
42. Reversing shaft bearings.
43. Reversing shaft brackets.
44. Valve chest, high-pressure cylinder.
45. Valve chest, intermediate-pressure cylinder.
46. Valve chest, forward low-pressure cylinder.
47. Valve chest covers.
48. Valve chest liners.
49. Valve stems.
50. Valve stem guides.
51. Valve stem stuffing boxes.
52. Cylinder liners.
53. Turning engine.
54. High-pressure steam port, top.
55. High-pressure steam port, bottom.
56. Expansion joints.



Engine, U. S. Armored Cruisers Washington and Tennessee.



Forward L. P. Cylinder, looking aft.

PLATE III.

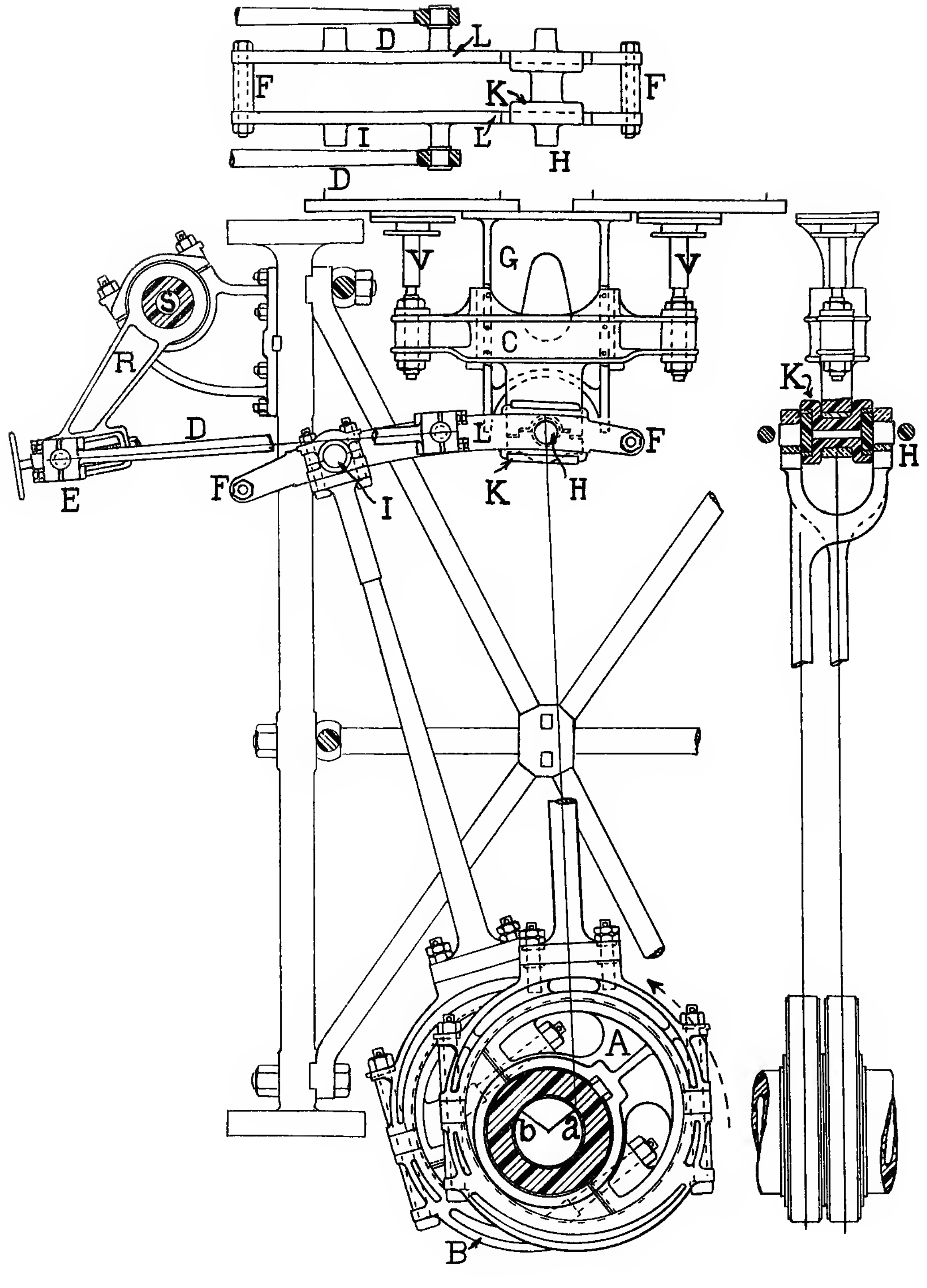
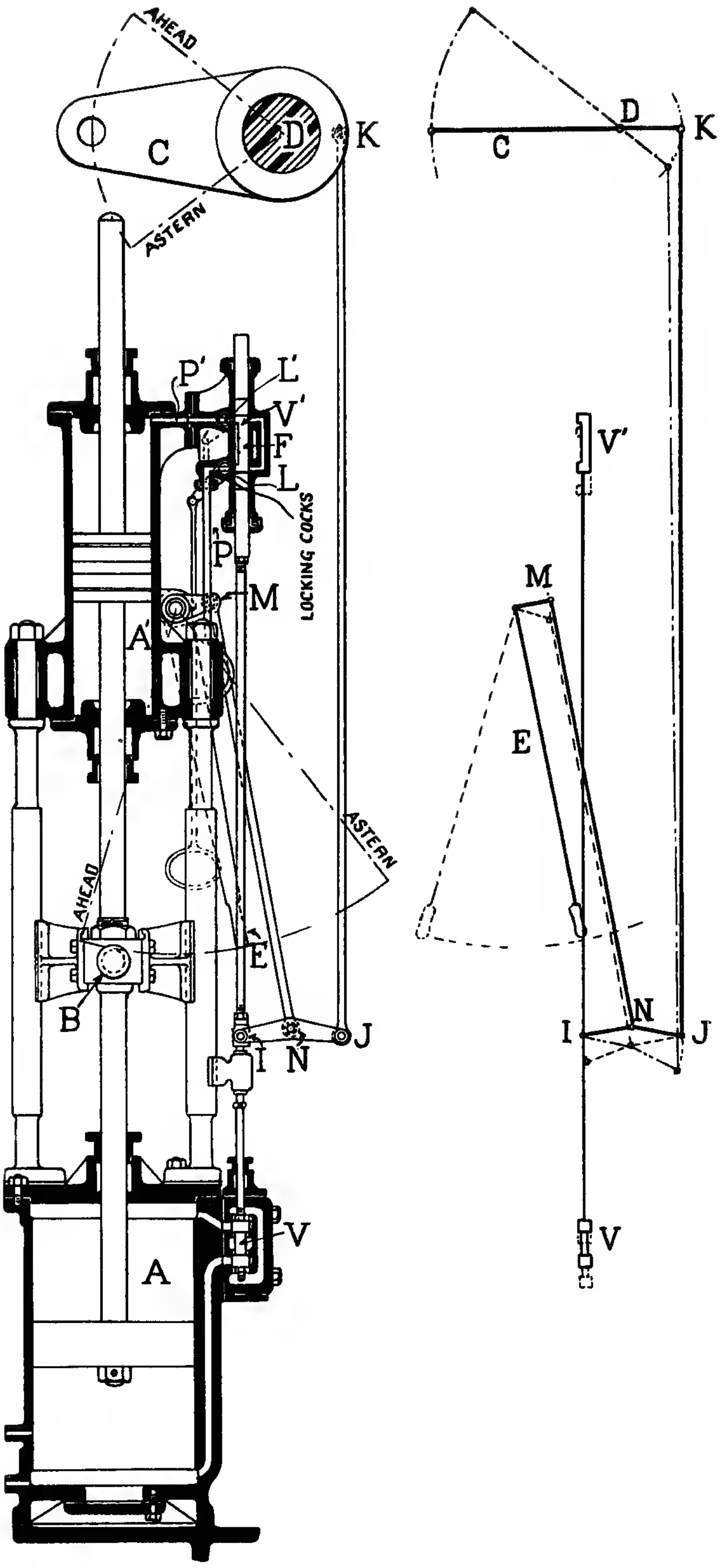


PLATE IV.



AHEAD
ASTERN
C
D
K
P'
L'
V'
F
L
LOCKING COCKS
P
M
A'
ASTERN
AHEAD
E
B
J
I
N
V
A
D
K
C
V'
M
E
I
N
J
V

PLATE V.

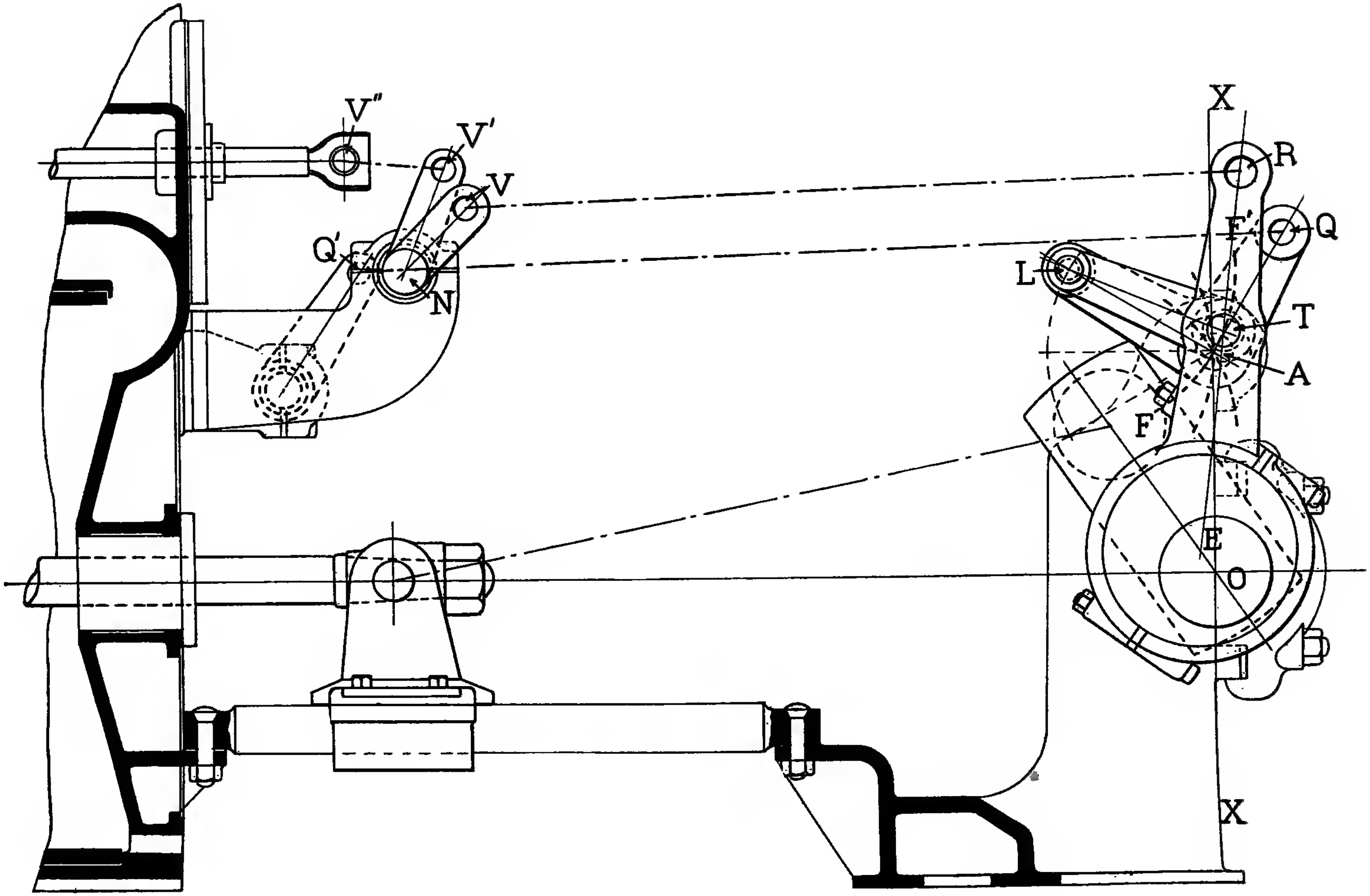


PLATE VI.

Fig. 1.

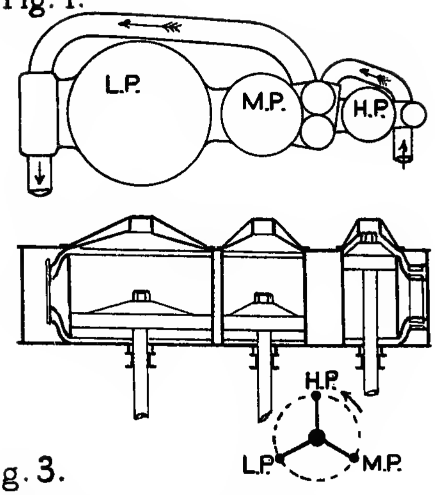


Fig. 2.

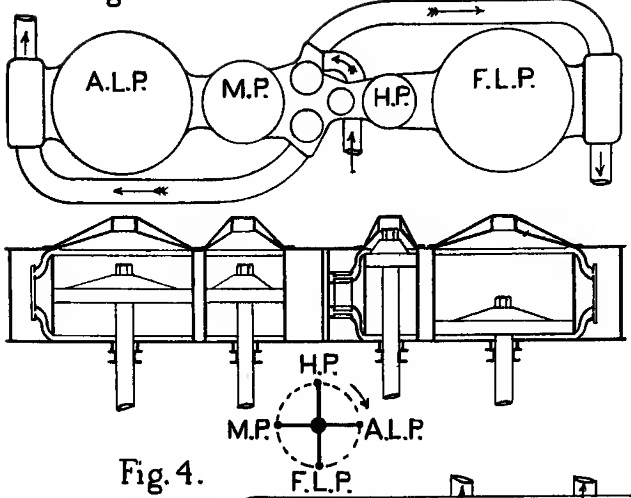


Fig. 3.

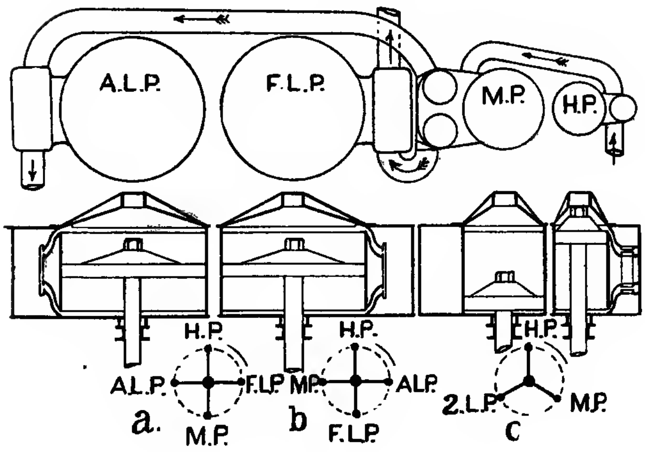


Fig. 4.

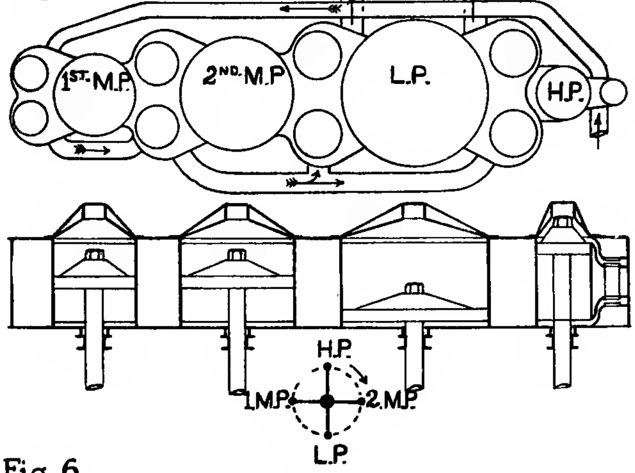


Fig. 5.

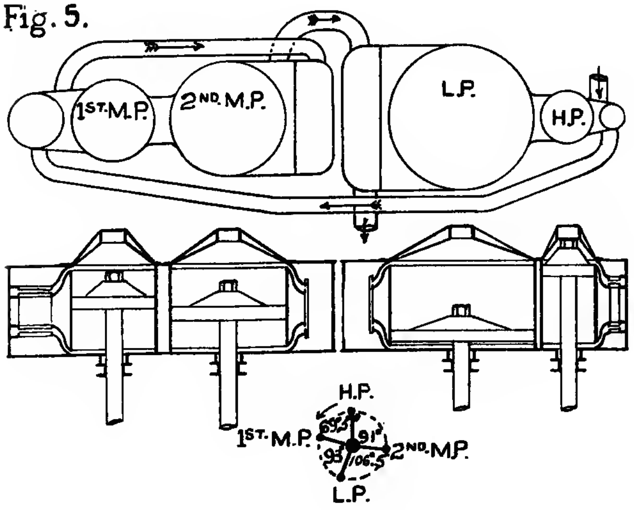
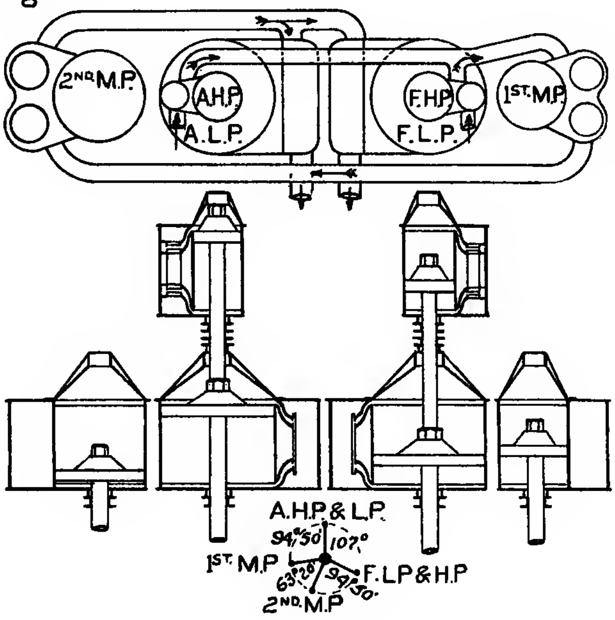


Fig. 6.



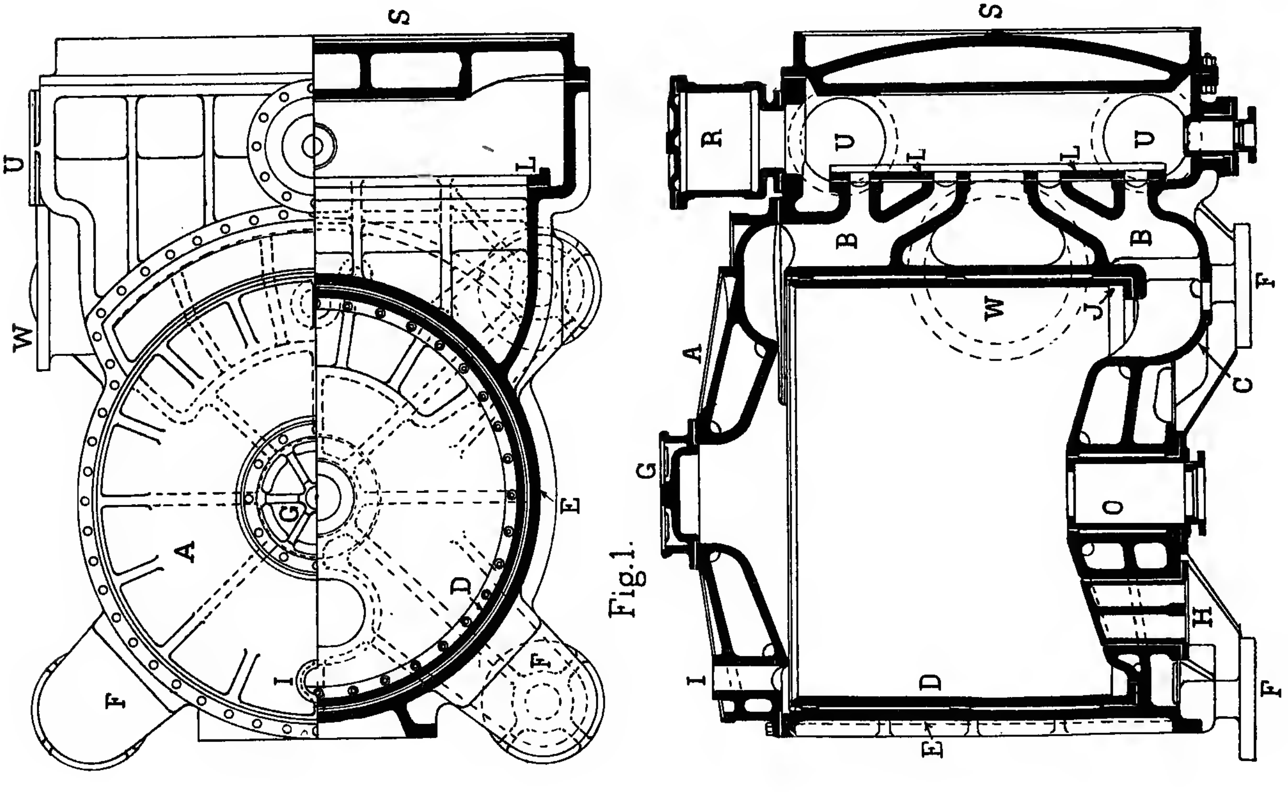

U
W
S
L
A
G
E
D
I
F
F
R
U
U
L
L
B
B
W
J
A
G
C
O
H
I
D
E
F
F
S

Fig.1.

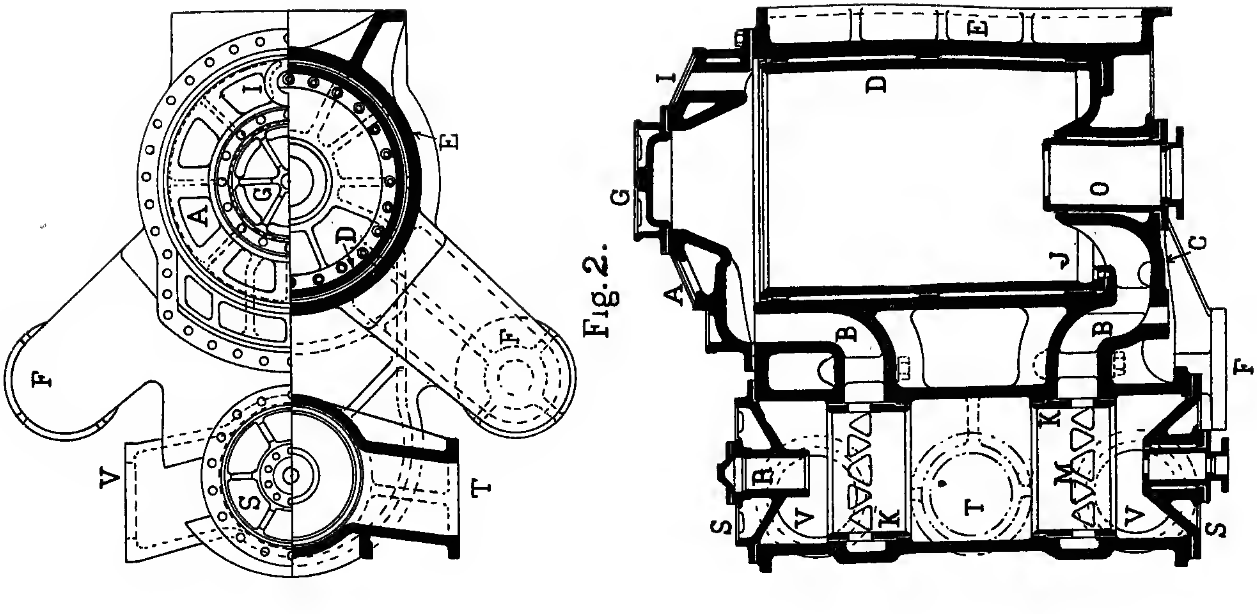

I
A
G
D
E
F
F
V
S
T
I
G
A
D
E
O
J
C
B
B
F
K
R
T
M
K
V
V
S
S

Fig.2.

PLATE VIII.

Fig. 1.

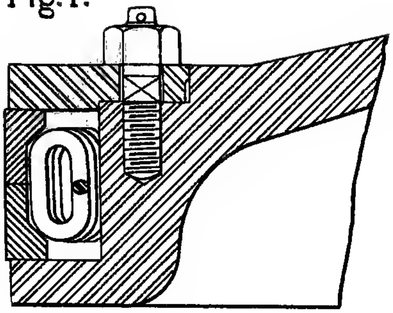


Fig. 2.

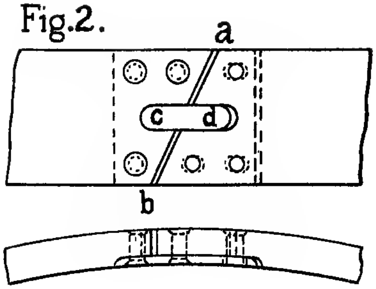


Fig. 3.

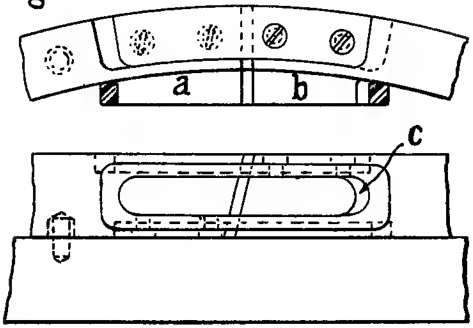


Fig. 4.

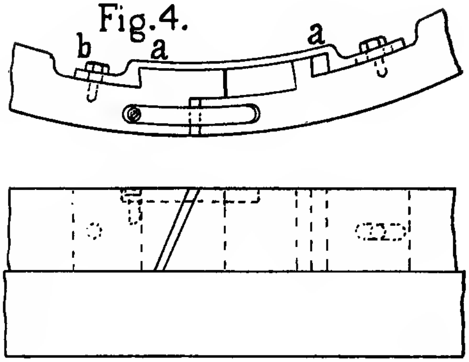


Fig. 6.

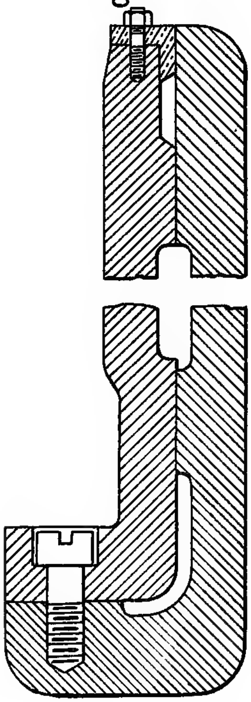


Fig. 7.

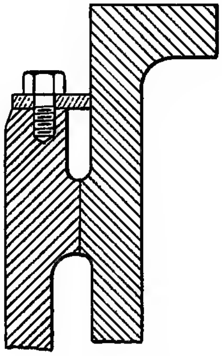


Fig. 8.

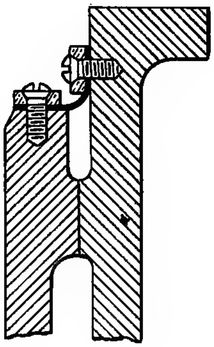


Fig. 5.

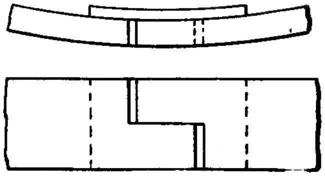


Fig. 10.

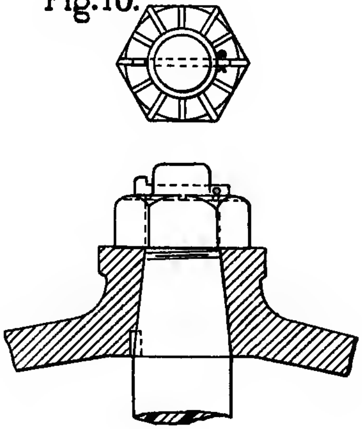


Fig. 9.

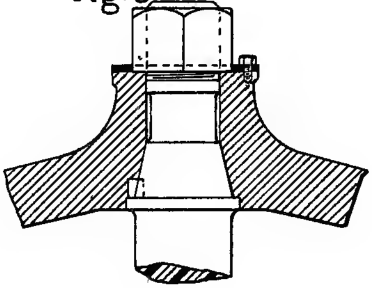


PLATE IX.

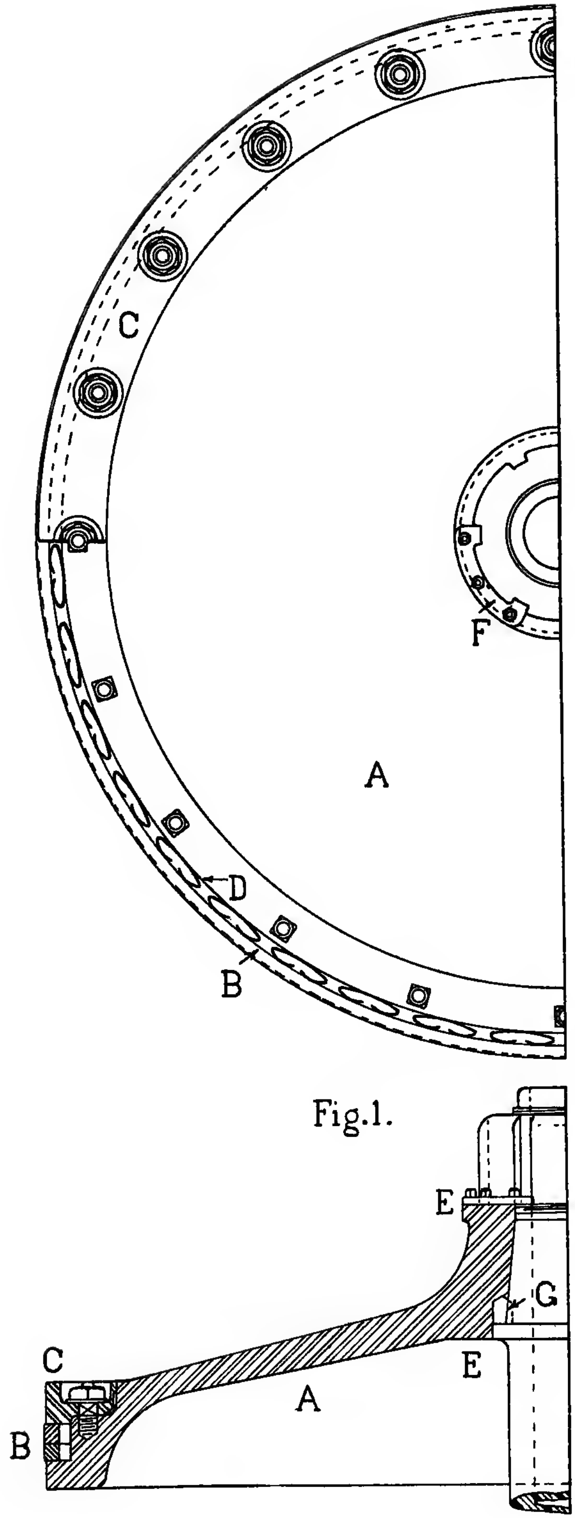


Fig. 1.

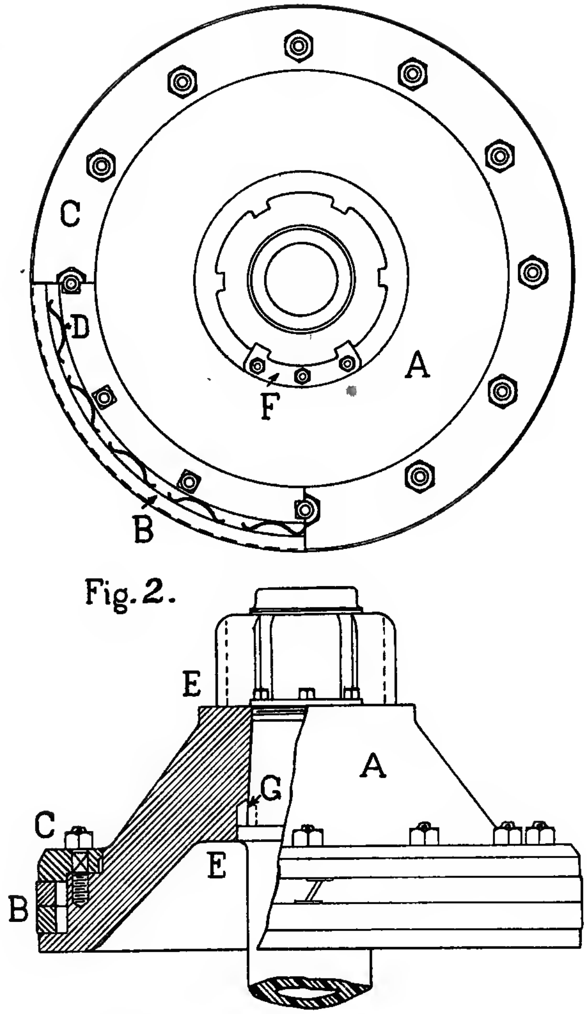


Fig. 2.

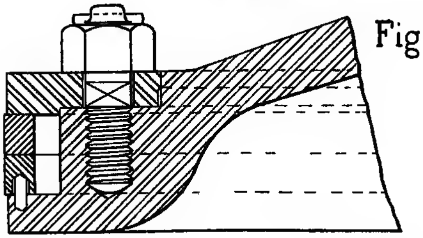


Fig. 3.

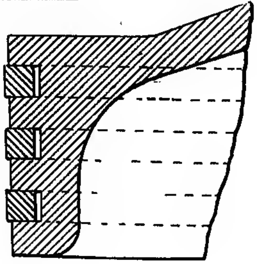


Fig. 4.

PLATE X.

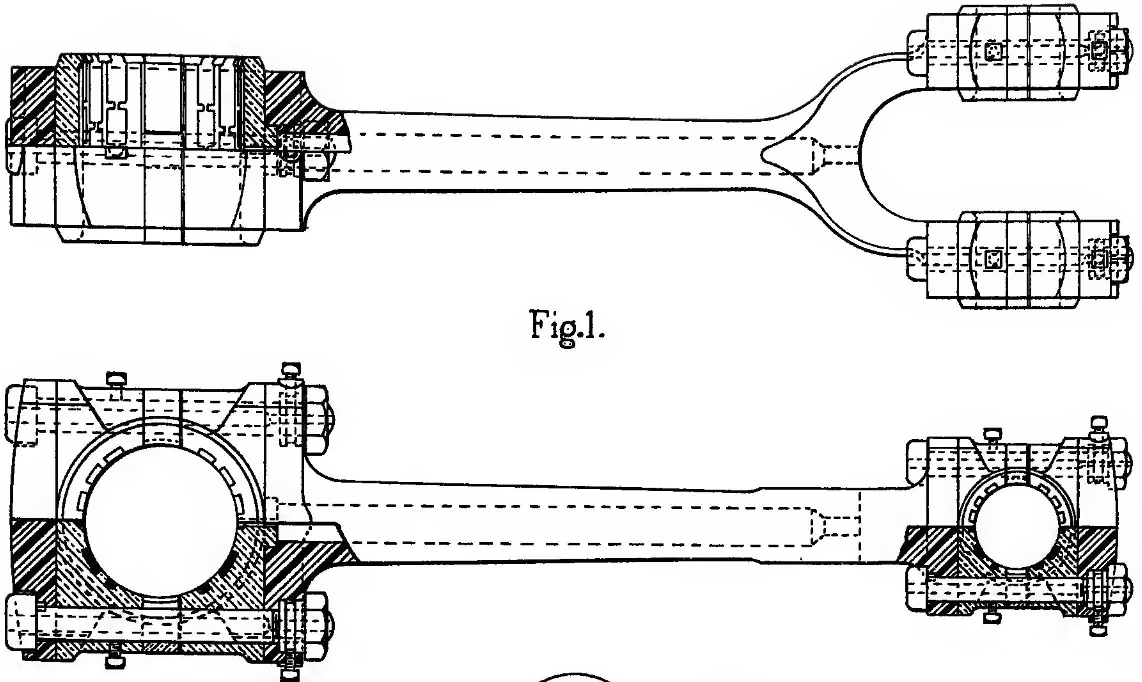


Fig.1.

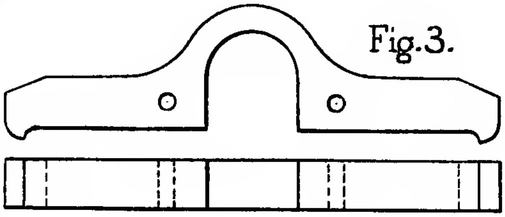


Fig.3.

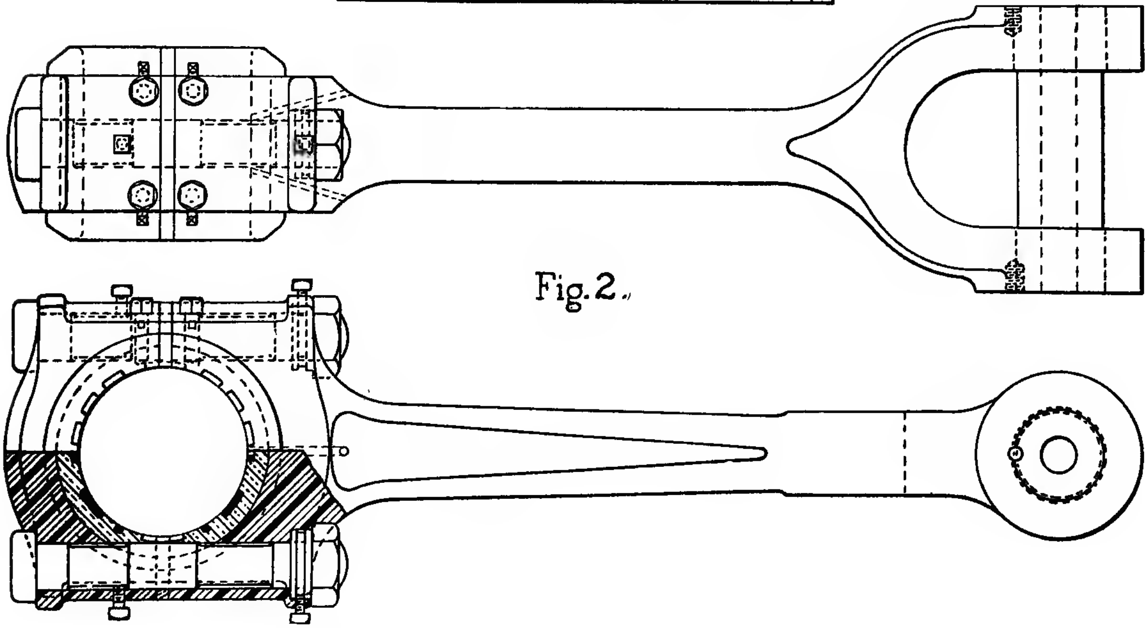


Fig. 2.

PLATE XI.

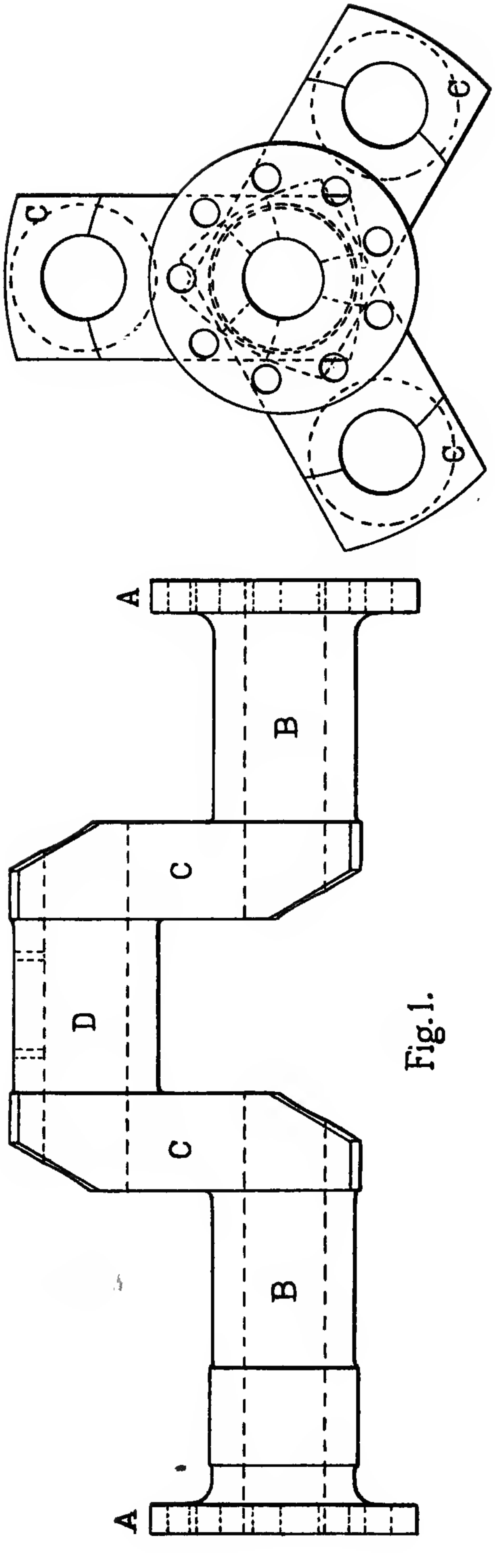


Fig. 1.

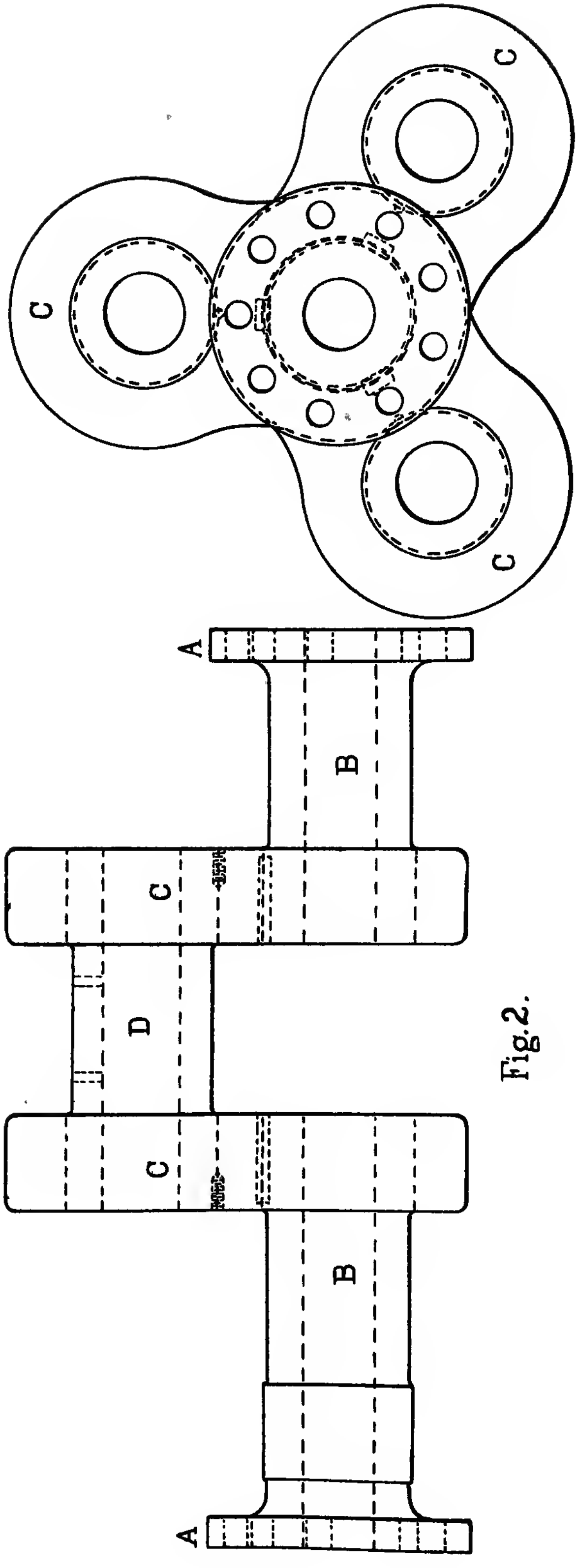


Fig. 2.

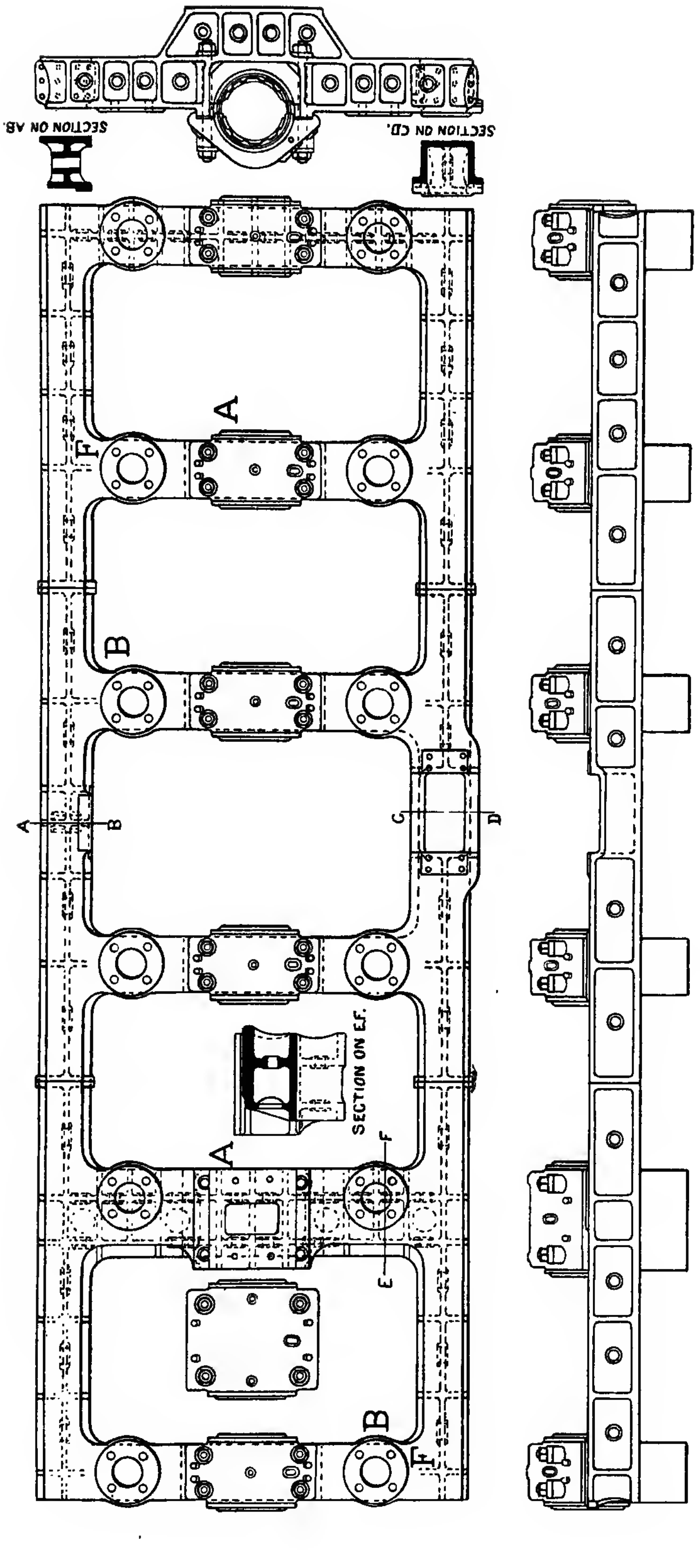

SECTION ON AB.
SECTION ON CD.
A
B
A
B
F
F
A
B
C
D
E
F
SECTION ON E.F.

Fig. 1.

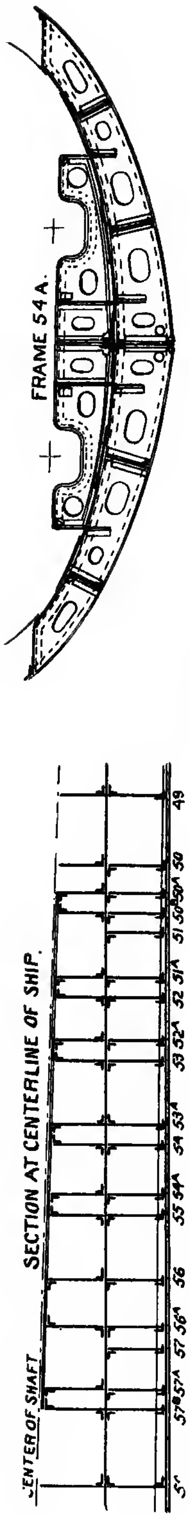

FRAME 54 A.
SECTION AT CENTERLINE OF SHIP.
CENTER OF SHAFT

Fig. 2.

PLATE XIII.

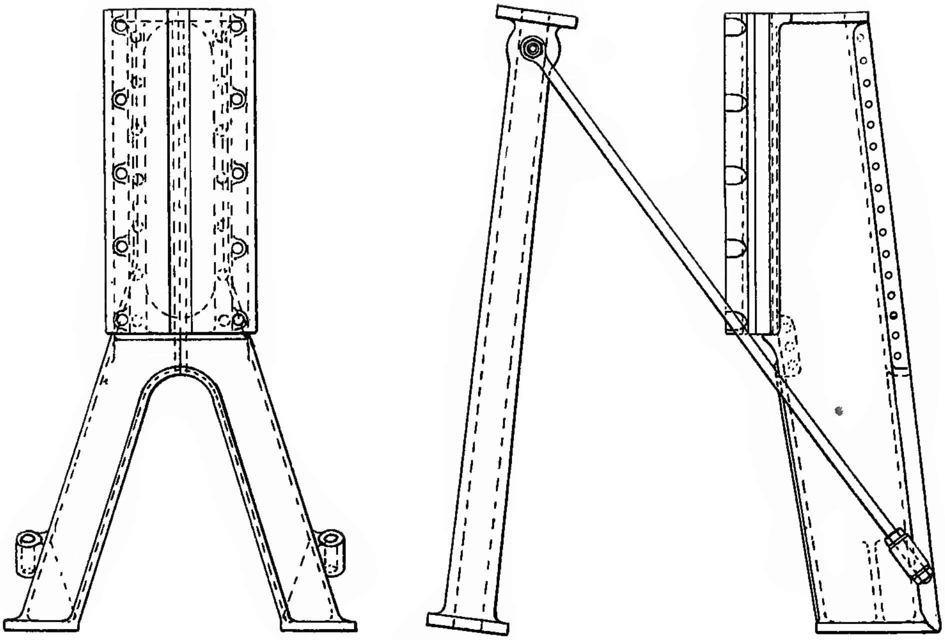


Fig. 1.

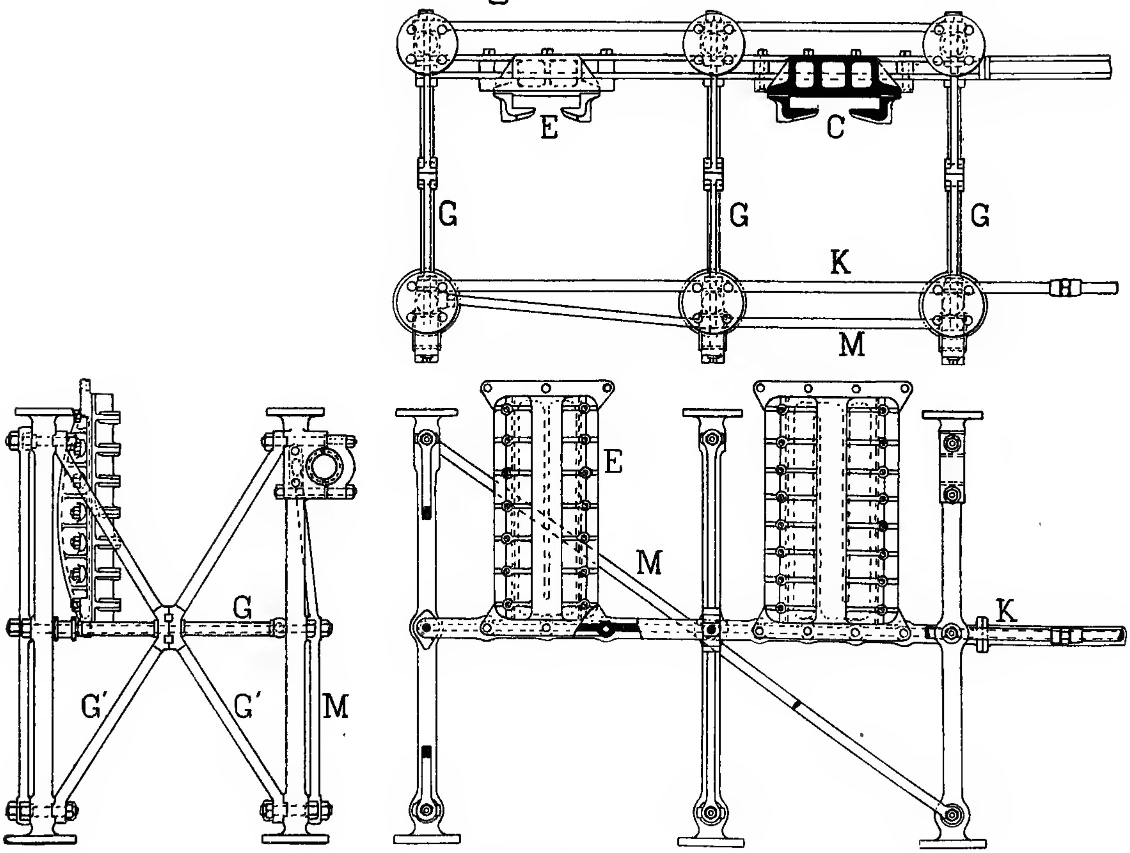


Fig. 2.

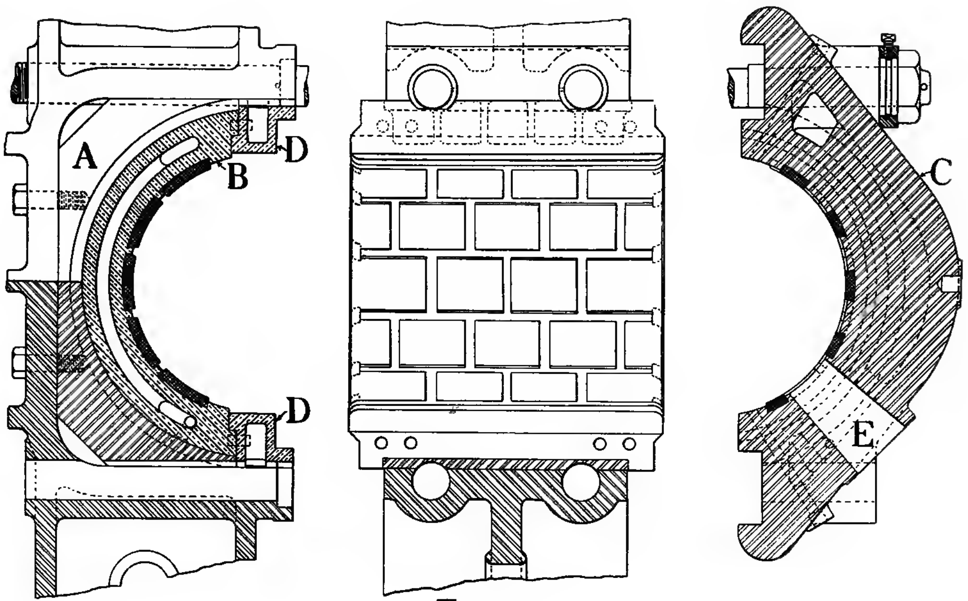


Fig.1.

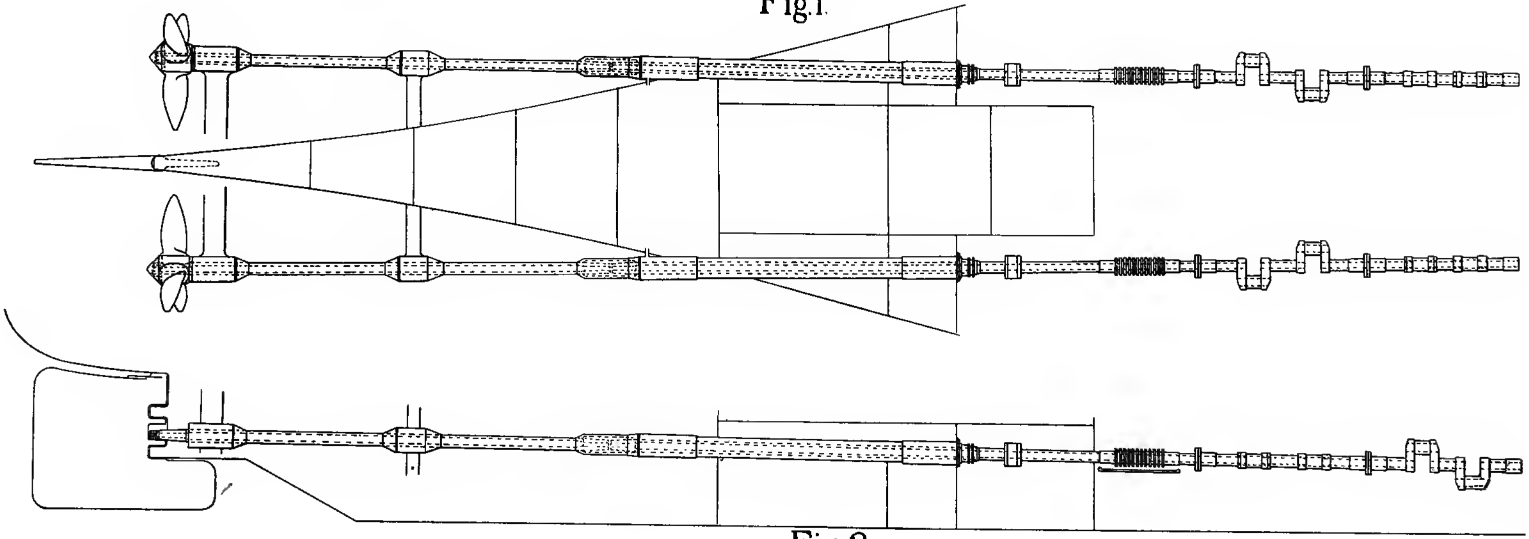
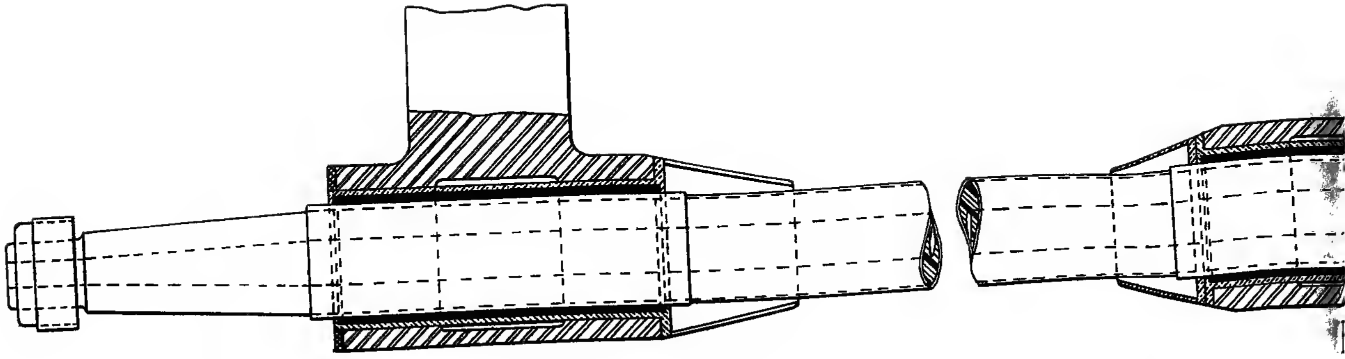


Fig.2.



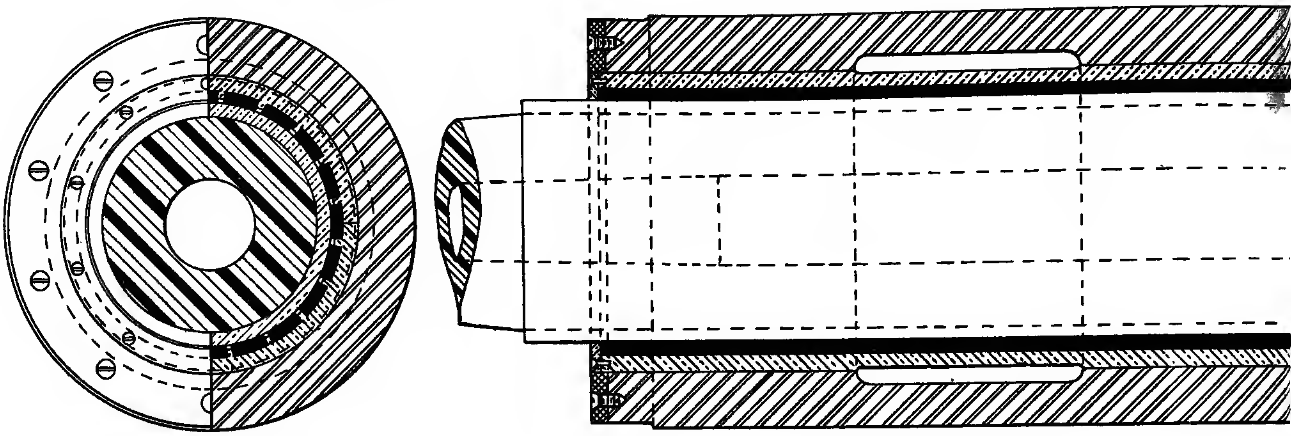


Fig 2.

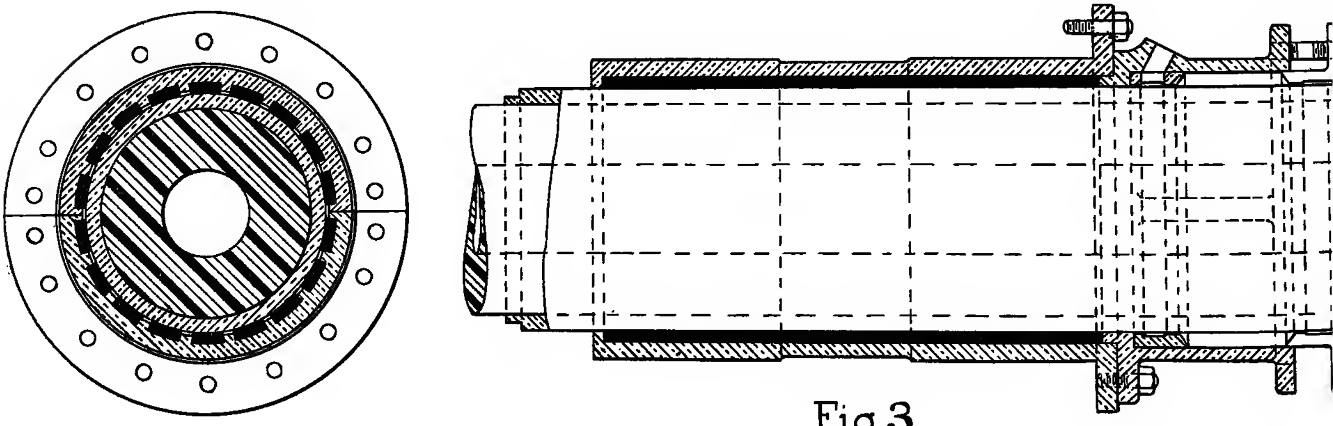


Fig.3.

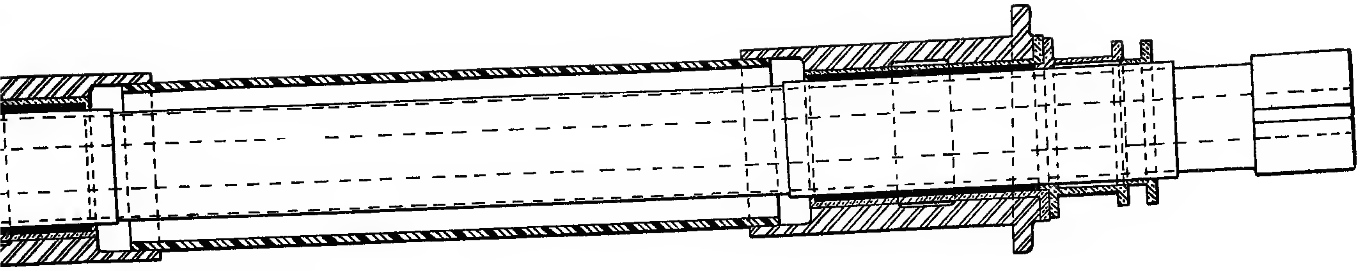
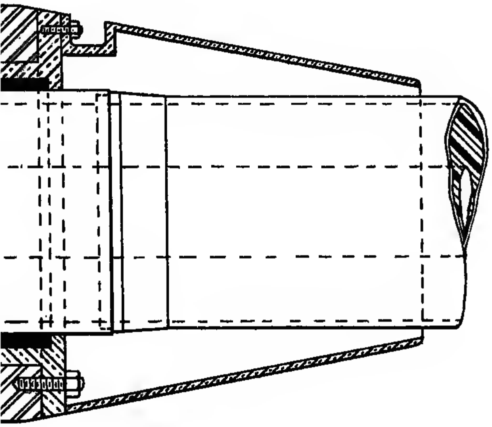


Fig.1.



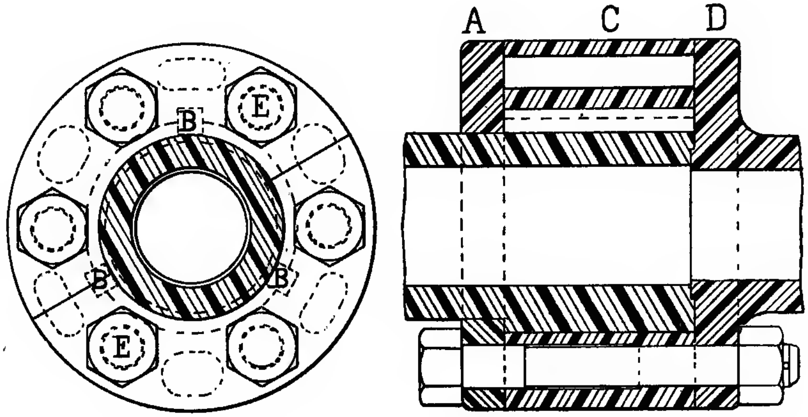
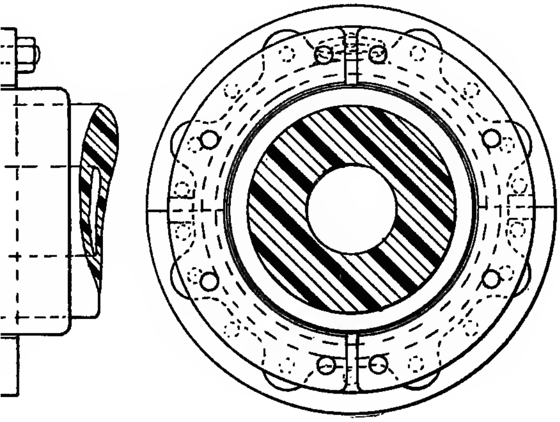


Fig.4.



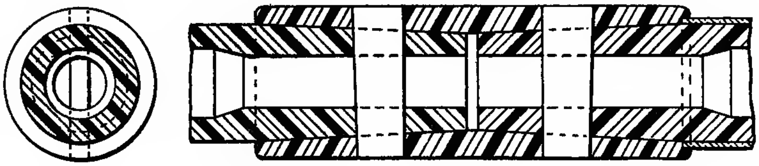


Fig.5.

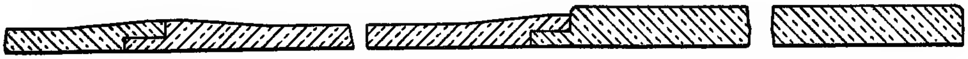


Fig.6.

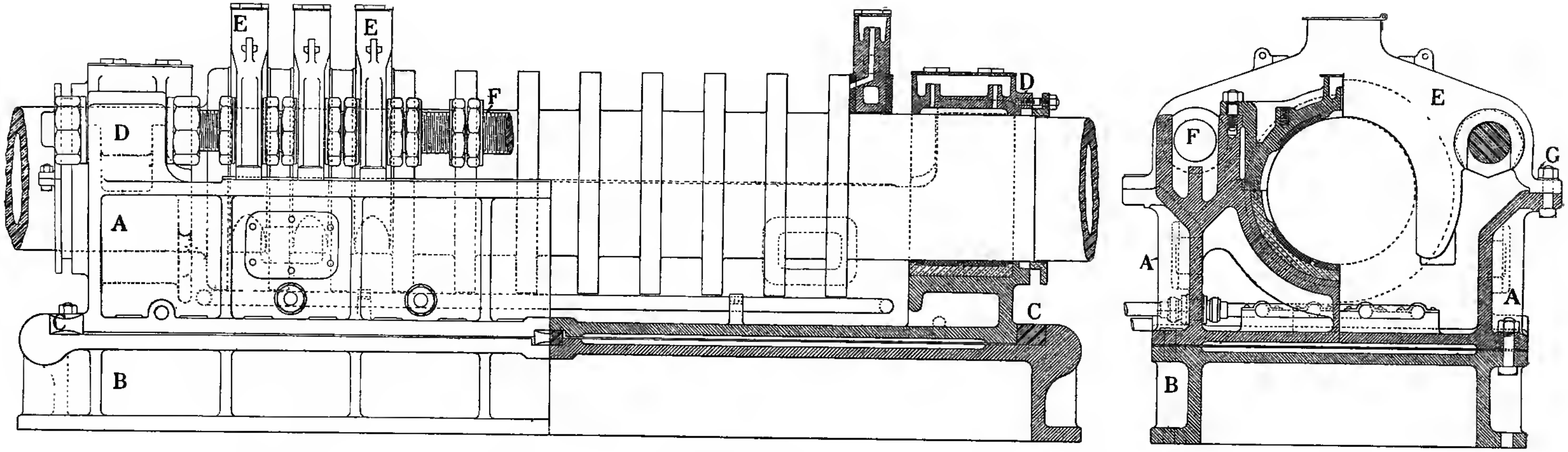


Fig.1.

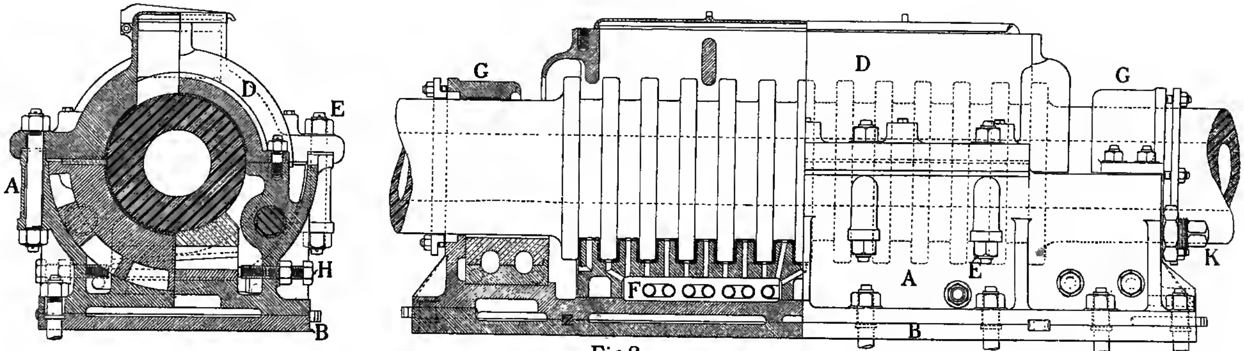
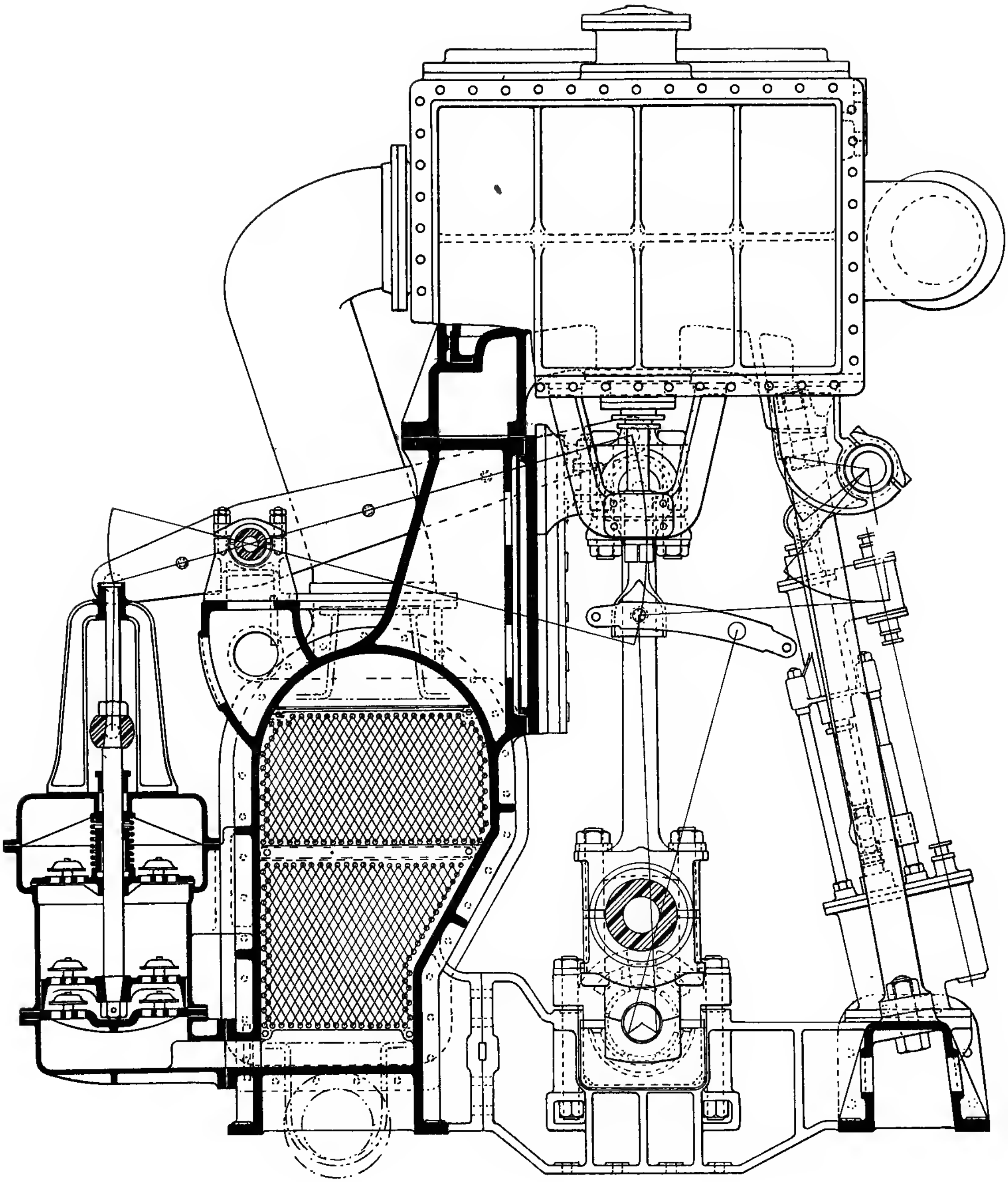
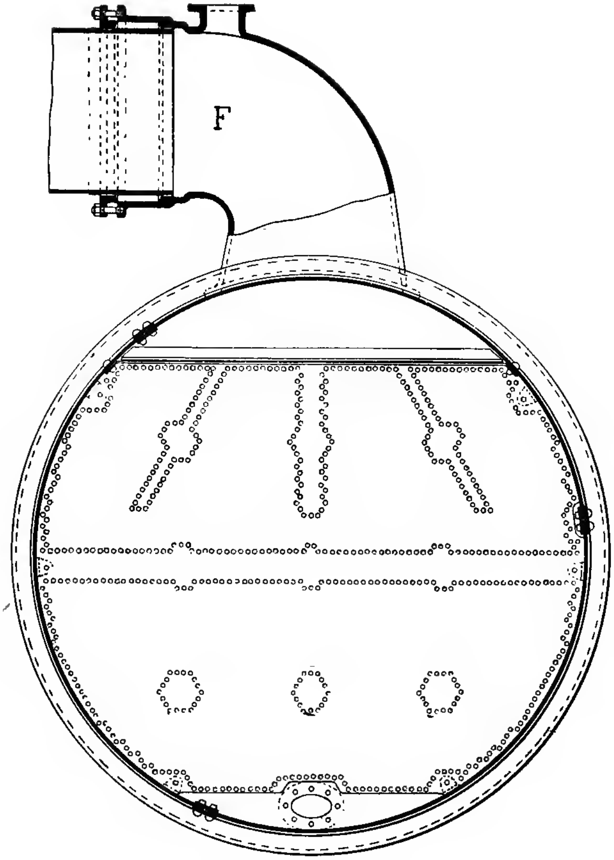
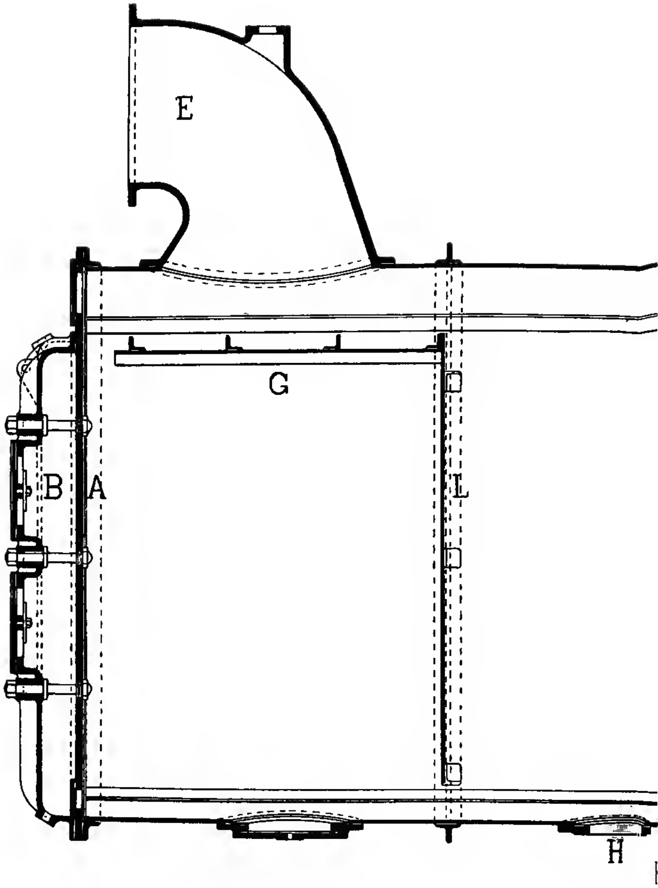


Fig.2.







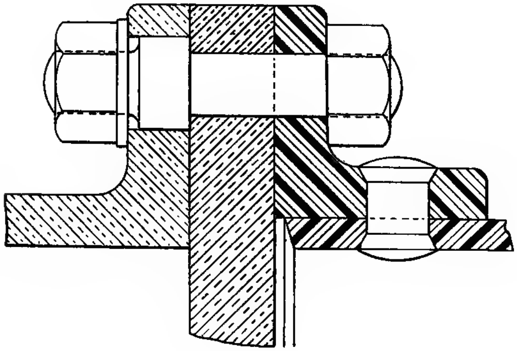
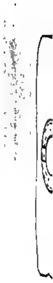


FIG.2.



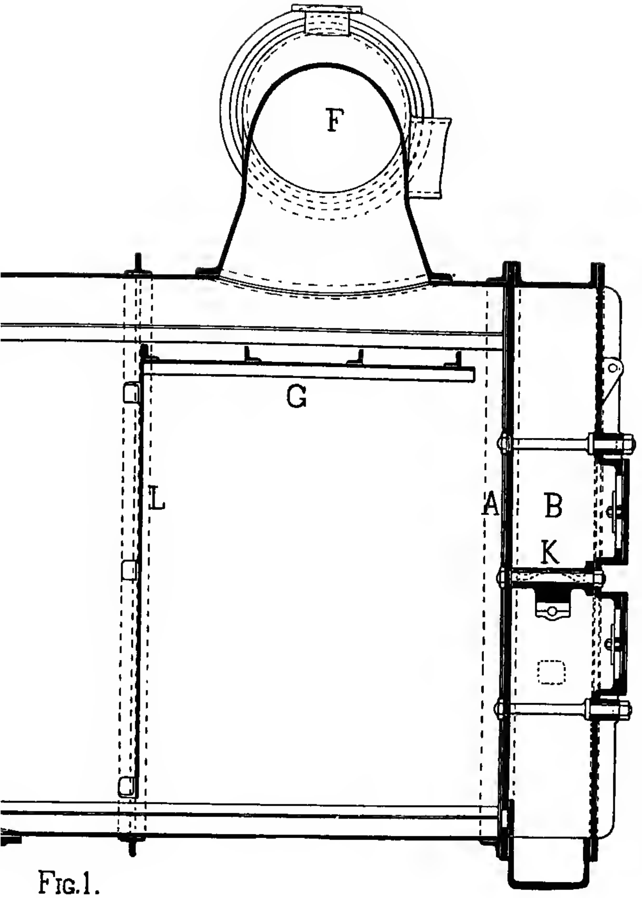
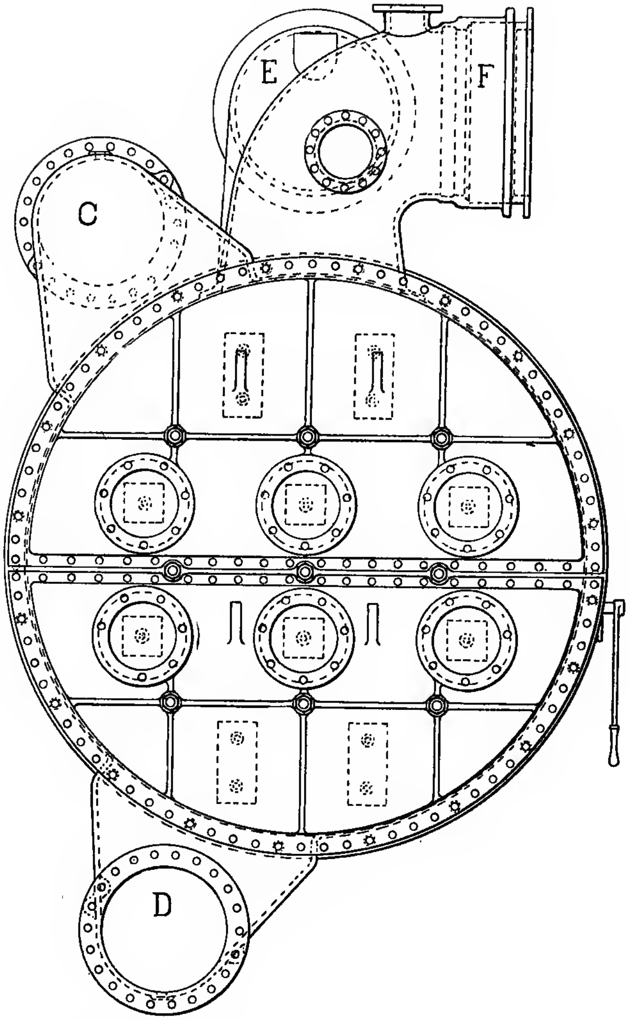


FIG.1.



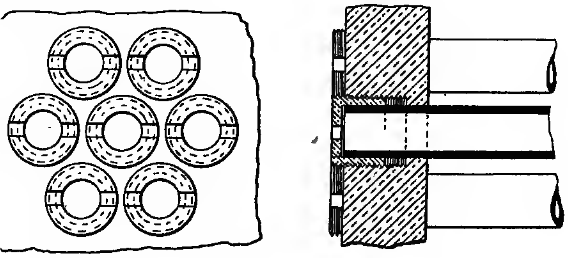


FIG.3.

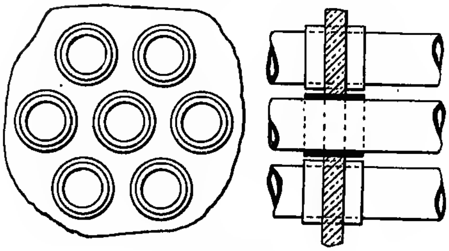


FIG.4.

PLATE XXI.

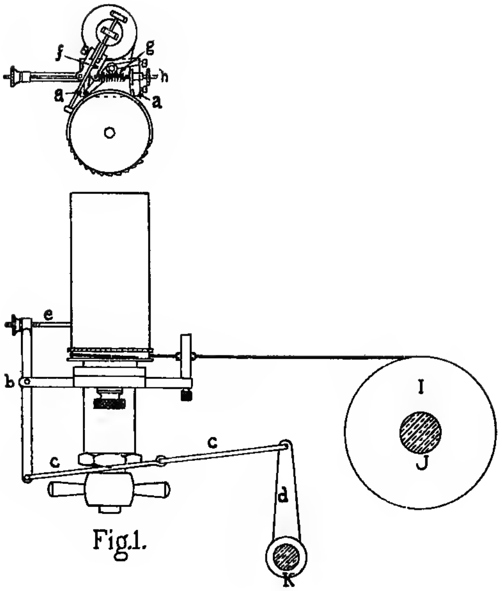


Fig.1.

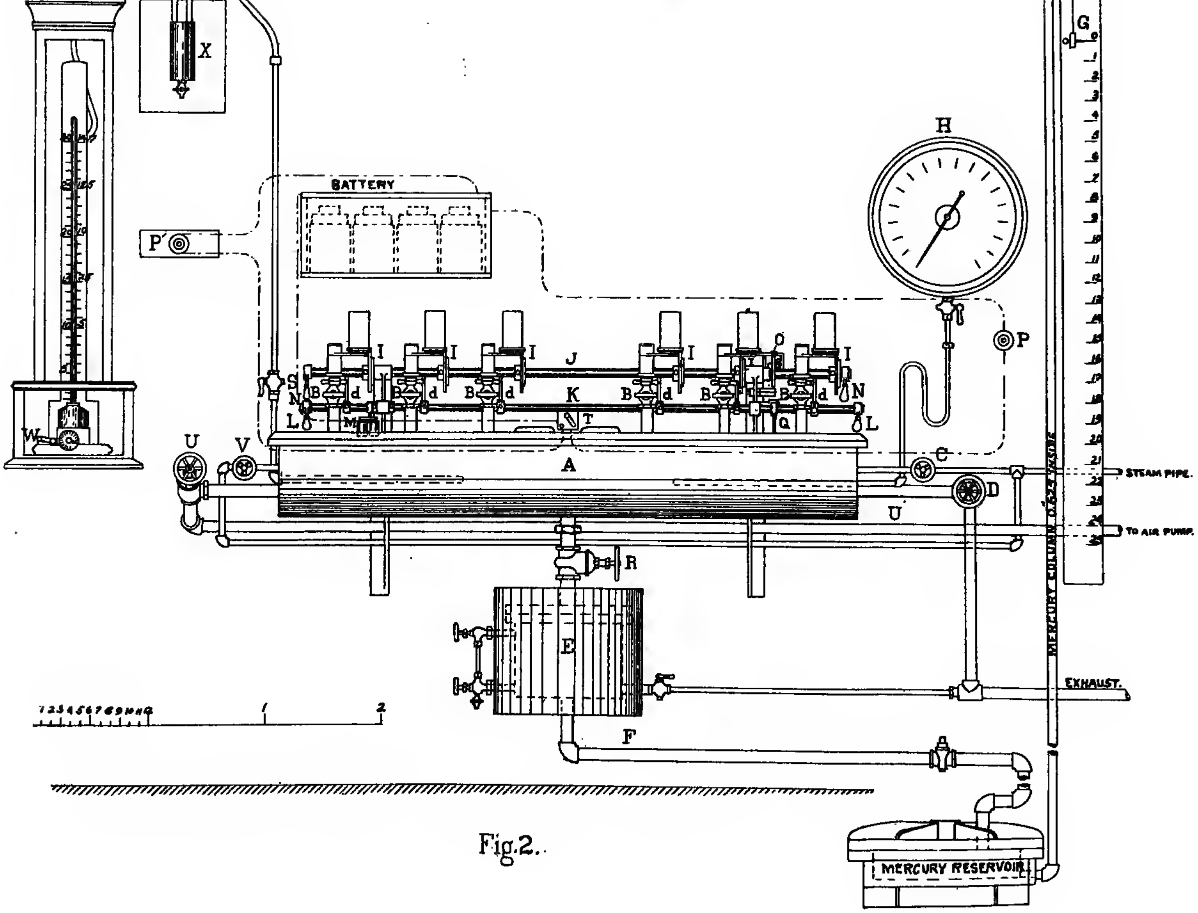
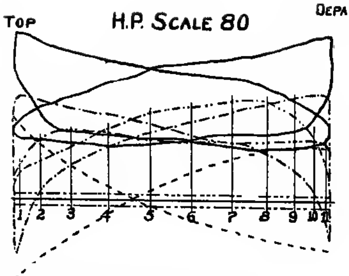
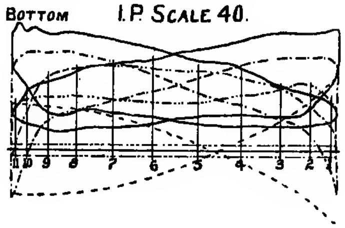


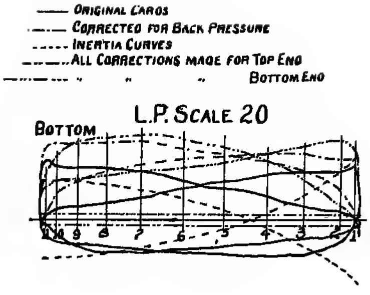
Fig.2.

CRANK EFFORT DIAGRAM

TO ACCOMPANY NOTES ON THE DESIGN OF PROPELLING
MACHINERY FOR NAVAL VESSELS.
DEPARTMENT OF MARINE ENGINEERING. U.S. NAVAL ACADEMY.







$I = .00034\frac{Wrn^2}{A}$, PER SQ. IN. OF PISTON

$I = .00034\times\frac{5252\times21\times130^2}{804.25\times12} = 65.42$

AT TOP $= 65.42\times\frac{5}{4} = 81.75$

AT BOTTOM $= 65.42\times\frac{3}{4} = 49$

WT. PER SQ. IN. $= \frac{5252}{804.25} = 6.5$

$= \frac{81.75}{2.2} = 37.16$

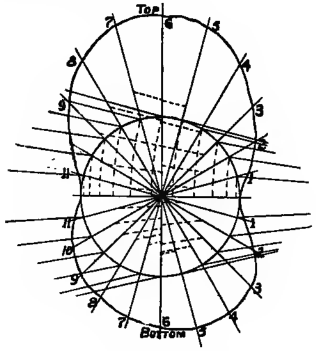
$= \frac{49}{2.2} = 22.27$

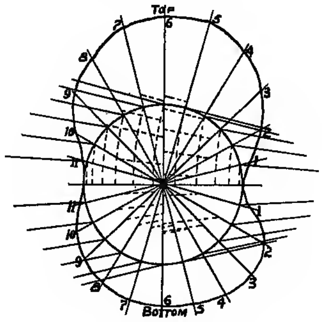
$= \frac{6.5}{2.2} = 2.95$

$= \frac{81.75}{5.2} = 15.72$

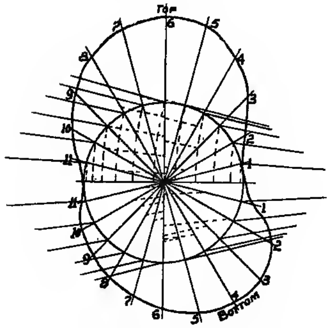
$= \frac{49}{5.2} = 9.42$

$= \frac{6.5}{5.2} = 1.25$

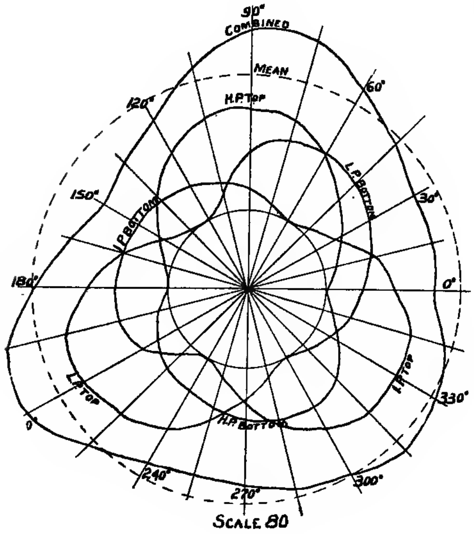


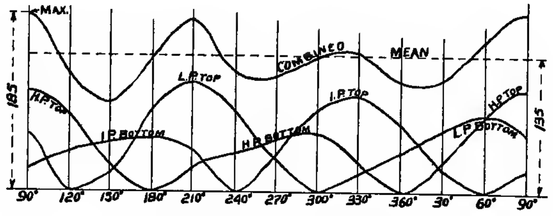


TO COMBINE ON SCALE OF H.P
MULTIPLY ALL ORDINATES
BY $2.2\times\frac{40}{80} = 1.1$



TO COMBINE ON SCALE OF H.P
MULTIPLY ALL ORDINATES
BY $5.2\times\frac{20}{80} = 1.3$



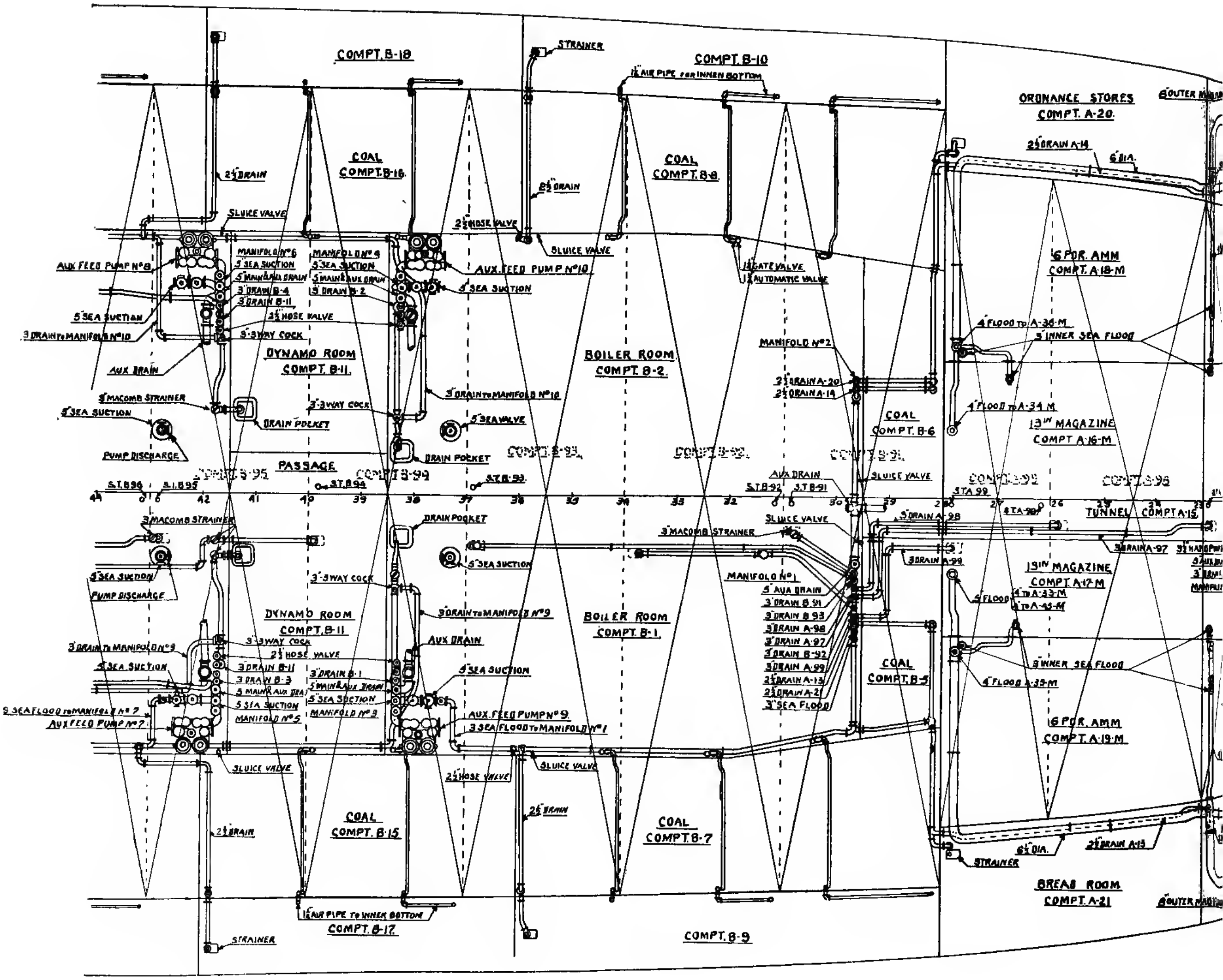


MAX. T.F. = 804.25 × 185 = 148786.25 POUNDS.
MEAN T.F. = 804.25 × 135 = 108573.75 "
RATIO OF MAX TO MEAN = $\frac{185}{135} = 1.37$

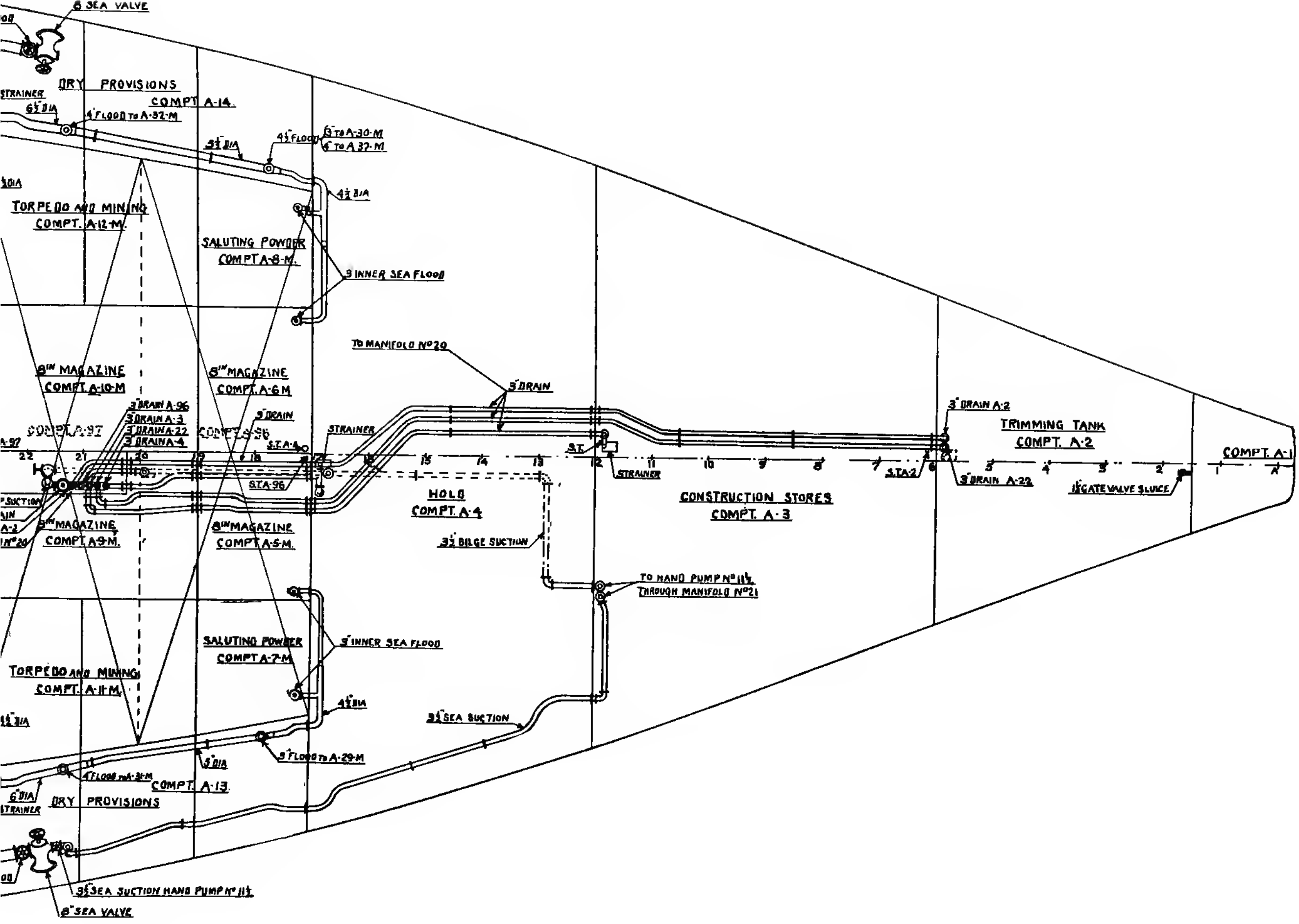
U.S.S. BROOKLYN.

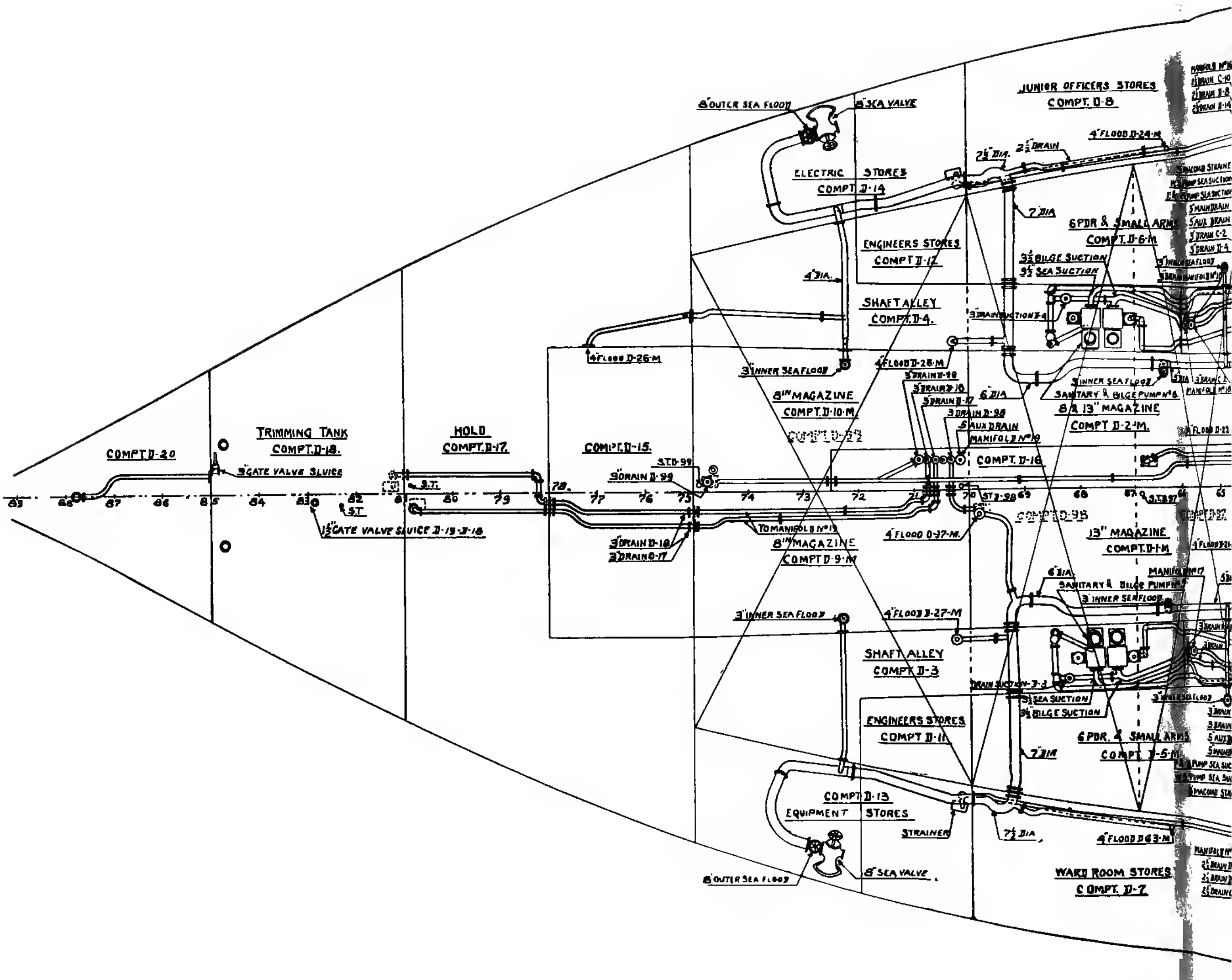
DATA:

AREA OF H.P. PISTON 804.25 SQ INS
RATIO OF PISTON AREAS 1:2.2:5.2
WEIGHT OF RECIPROCATING PARTS 5252 LBS.
STROKE 42". CONNECTING ROD 84"
REVOLUTIONS 130 PER MINUTE
VERTICAL, TRIPLE EXPANSION ENGINE
CRANKS AT 120°


COMPT. B-18
COAL
COMPT. B-16
2½ DRAIN
SLUICE VALVE
AUX FEED PUMP Nº 8
MANIFOLD Nº 6
5 SEA SUCTION
5 MAIN & AUX DRAIN
3 DRAIN B-4
3 DRAIN B-11
2½ HOSE VALVE
3·3 WAY COCK
5 SEA SUCTION
3 DRAIN TO MANIFOLD Nº 10
AUX DRAIN
DYNAMO ROOM
COMPT. B-11
5 MACOMB STRAINER
5 SEA SUCTION
DRAIN POCKET
PUMP DISCHARGE
MANIFOLD Nº 9
5 SEA SUCTION
5 MAIN & AUX DRAIN
3 DRAIN B-2
STRAINER
2½ DRAIN
2½ HOSE VALVE
SLUICE VALVE
AUX. FEED PUMP Nº 10
5 SEA SUCTION
5 DRAIN TO MANIFOLD Nº 10
3·3 WAY COCK
5 SEA VALVE
DRAIN POCKET
COMPT. B-10
1½ AIR PIPE FOR INNER BOTTOM
COAL
COMPT. B-8
BOILER ROOM
COMPT. B-2
1½ GATE VALVE
1½ AUTOMATIC VALVE
MANIFOLD Nº 2
2½ DRAIN A-20
2½ DRAIN A-14
COAL
COMPT. B-6
PASSAGE
COMPT. B-95
COMPT. B-94
COMPT. B-93
COMPT. B-92
COMPT. B-91
S.T. B 96
S.T. B 95
S.T. B 94
S.T. B-93
S.T. B-92
S.T. B-91
44
42
41
40
39
38
37
36
35
34
33
32
30
29
28
27
26
25
24
23
AUX DRAIN
SLUICE VALVE
3 MACOMB STRAINER
DRAIN POCKET
5 SEA SUCTION
PUMP DISCHARGE
3·3 WAY COCK
3 DRAIN TO MANIFOLD Nº 9
AUX DRAIN
DYNAMO ROOM
COMPT. B-11
3 DRAIN TO MANIFOLD Nº 9
5 SEA SUCTION
3·3 WAY COCK
2½ HOSE VALVE
3 DRAIN B-11
3 DRAIN B-3
5 MAIN & AUX DRAIN
5 SEA SUCTION
MANIFOLD Nº 5
5 SEA FLOOD TO MANIFOLD Nº 7
AUX FEED PUMP Nº 7
3 DRAIN B-1
5 MAIN & AUX DRAIN
5 SEA SUCTION
MANIFOLD Nº 3
5 SEA SUCTION
AUX. FEED PUMP Nº 9
3 SEA FLOOD TO MANIFOLD Nº 1
SLUICE VALVE
2½ HOSE VALVE
SLUICE VALVE
2½ DRAIN
2½ DRAIN
STRAINER
COAL
COMPT. B-15
1½ AIR PIPE TO INNER BOTTOM
COMPT. B-17
BOILER ROOM
COMPT. B-1
SLUICE VALVE
3 MACOMB STRAINER
MANIFOLD Nº 1
5 AUX DRAIN
3 DRAIN B 91
3 DRAIN B 93
3 DRAIN A-98
3 DRAIN A-97
3 DRAIN B-92
3 DRAIN A-99
2½ DRAIN A-13
2½ DRAIN A-21
3 SEA FLOOD
COAL
COMPT. B-5
COAL
COMPT. B-7
COMPT. B-9
5 DRAIN A-98
3 DRAIN A-99
ORDNANCE STORES
COMPT. A-20
2½ DRAIN A-14
6 DIA.
6 PDR. AMM
COMPT. A-18-M
4 FLOOD TO A-36-M
5 INNER SEA FLOOD
4 FLOOD TO A-34 M
13IN MAGAZINE
COMPT. A-16-M
COMPT. A-99
COMPT. A-98
STA 99
STA 98
TUNNEL COMPT. A-15
3 DRAIN A-97
13IN MAGAZINE
COMPT. A-17-M
5 FLOOD
4 TO A-33-M
4 TO A-45-M
5 INNER SEA FLOOD
4 FLOOD A-35-M
6 PDR. AMM
COMPT. A-19-M
6½ DIA.
2½ DRAIN A-13
STRAINER
BREAD ROOM
COMPT. A-21

PLATES XXIII AND XXIV.





COMPT. D-20
TRIMMING TANK
COMPT. D-18.
5" GATE VALVE SLUICE
1½" GATE VALVE SLUICE D-19-D-18
S.T.
HOLD
COMPT. D-17.
COMPT. D-15.
ST. D-99
5" DRAIN D-99
3" DRAIN D-18
3" DRAIN D-17
TO MANIFOLD No 19
8" MAGAZINE
COMPT. D-9-M
8" MAGAZINE
COMPT. D-10-M.
COMPT. D-22
4" FLOOD D-26-M
3" INNER SEA FLOOD
4" DIA.
8" OUTER SEA FLOOD
8" SEA VALVE
ELECTRIC STORES
COMPT. D-14
ENGINEERS STORES
COMPT. D-12
SHAFT ALLEY
COMPT. D-4.
4" FLOOD D-28-M
5" DRAIN D-19
5" DRAIN D-18
5" DRAIN D-17
3" DRAIN D-98
5" AUX DRAIN
MANIFOLD No 19
6" DIA
COMPT. D-16
ST. D-98
4" FLOOD D-37-M.
COMPT. D-23
3" INNER SEA FLOOD
4" FLOOD D-27-M
SHAFT ALLEY
COMPT. D-3
ENGINEERS STORES
COMPT. D-11
COMPT. D-13
EQUIPMENT STORES
STRAINER
8" OUTER SEA FLOOD
8" SEA VALVE
7½" DIA
JUNIOR OFFICERS STORES
COMPT. D-8
2½" DIA.
2½" DRAIN
4" FLOOD D-24-M
7" DIA
6 PDR & SMALL ARMS
COMPT. D-6-M
3½" BILGE SUCTION
3½" SEA SUCTION
3" DRAIN SUCTION D-4
3" INNER SEA FLOOD
SANITARY & BILGE PUMP No 6
8 & 13" MAGAZINE
COMPT. D-2-M.
S.T. D-97
13" MAGAZINE
COMPT. D-1-M
6" DIA.
SANITARY & BILGE PUMP No 5
3" INNER SEA FLOOD
MANIFOLD No 17
DRAIN SUCTION D-3
3½" SEA SUCTION
3½" BILGE SUCTION
6 PDR. & SMALL ARMS
COMPT. D-5-M
7" DIA
4" FLOOD D-63-M
WARD ROOM STORES
COMPT. D-7.
88
88
87
86
85
84
83
82
81
80
79
78.
77
76
75
74
73
72
71
70
69
68
67
66
65

PLATES XXV AND XXVI.

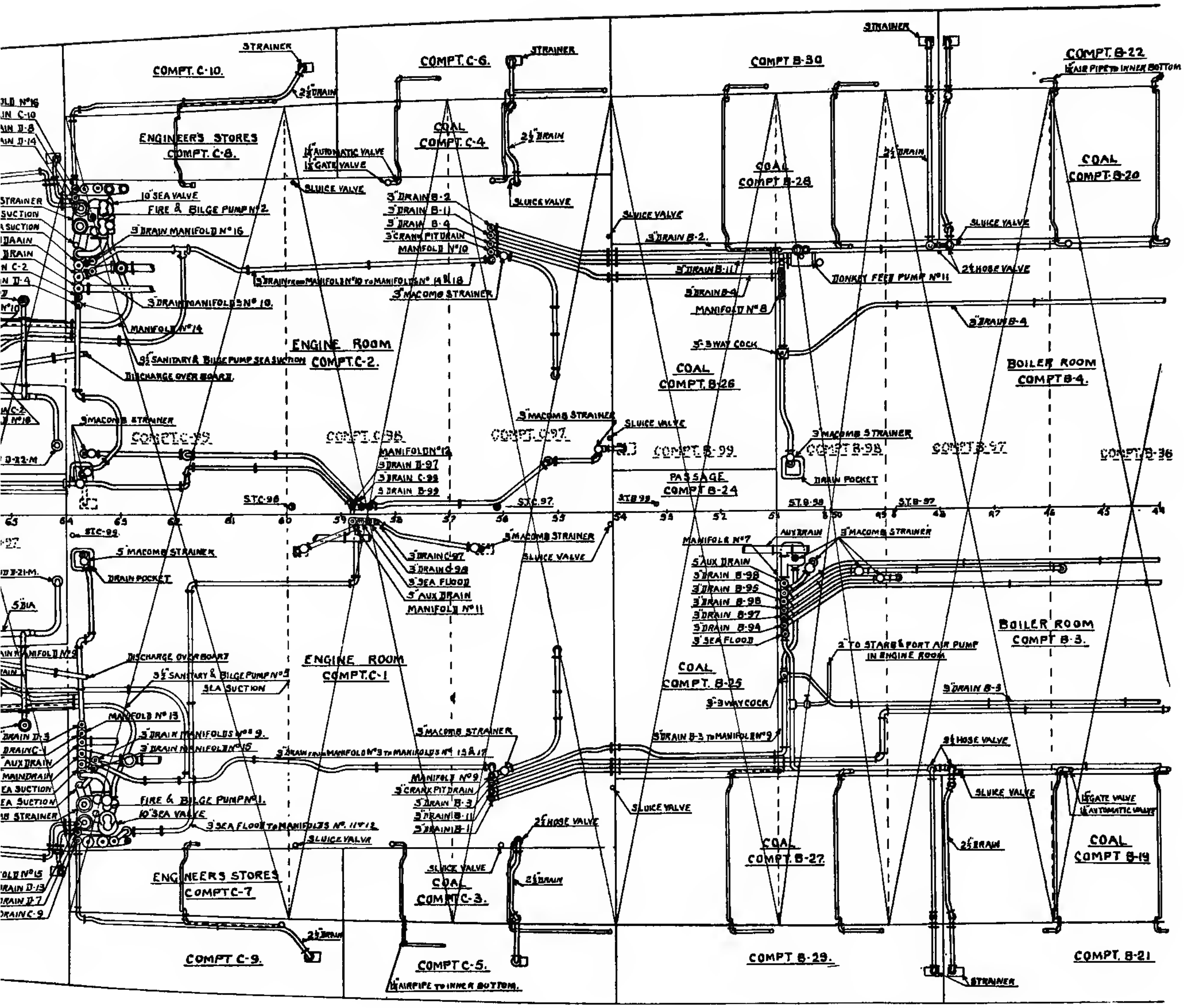
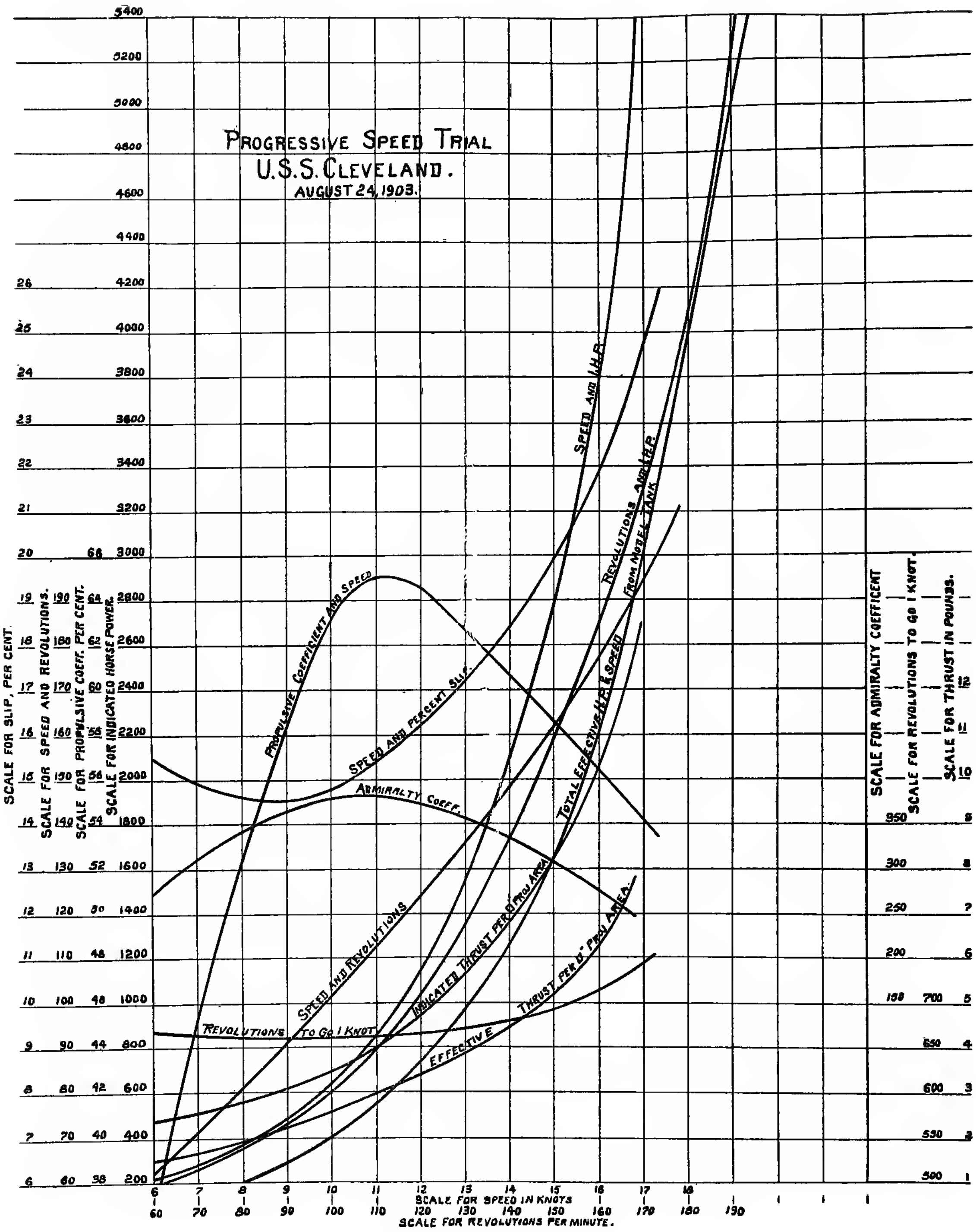
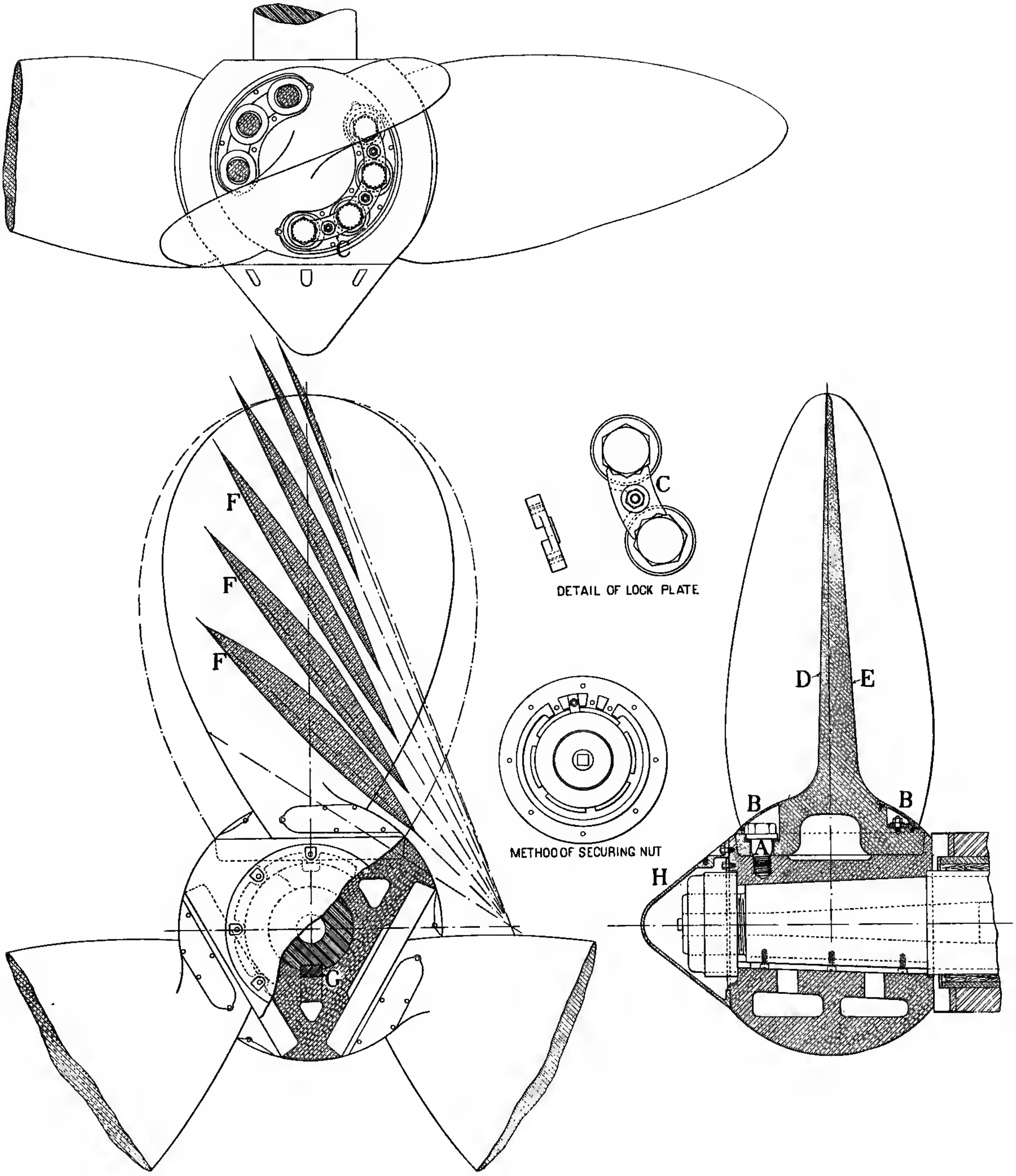


PLATE XXVII.



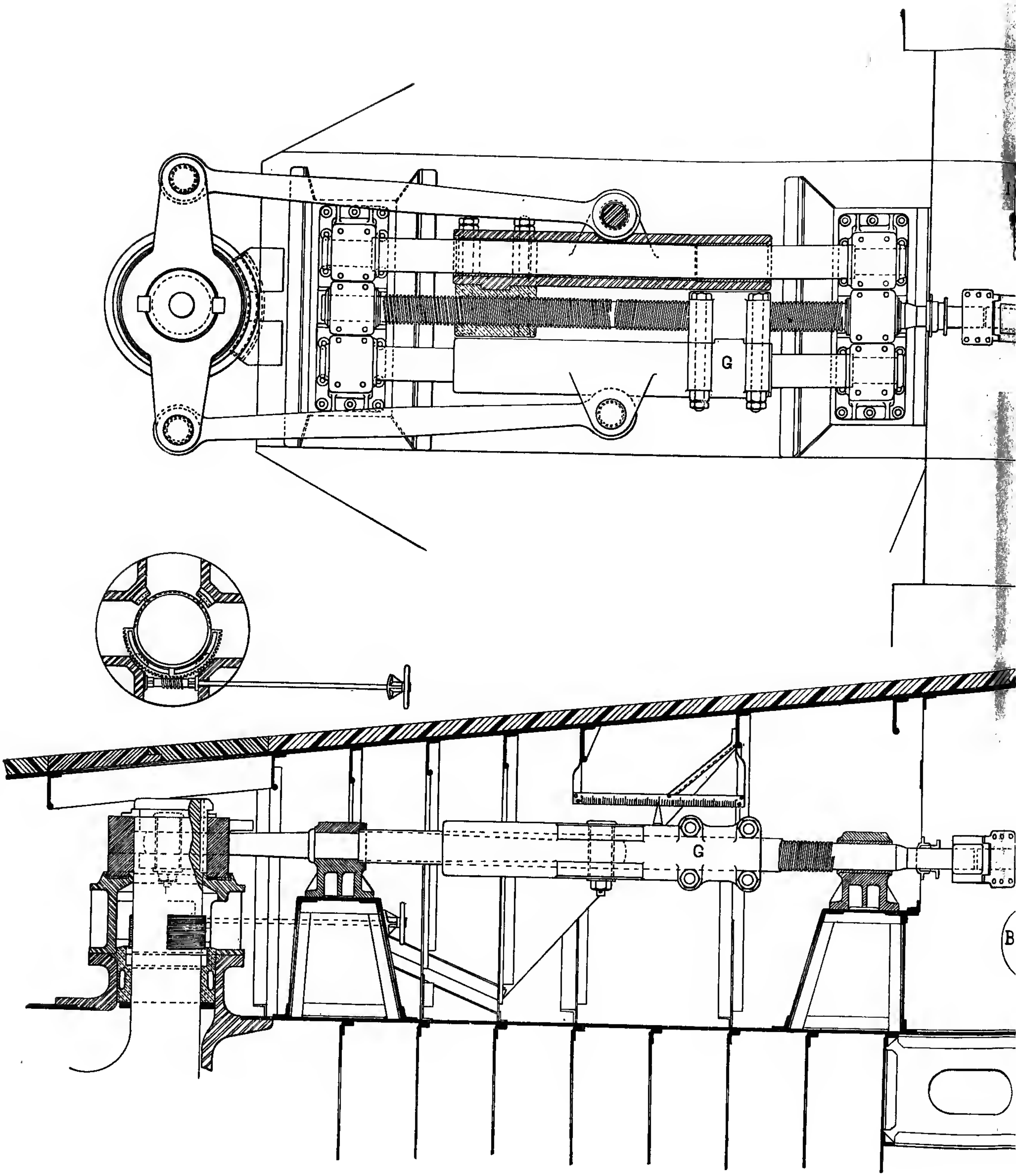
PROGRESSIVE SPEED TRIAL
U.S.S. CLEVELAND.
AUGUST 24, 1903.

PLATE XXVIII.

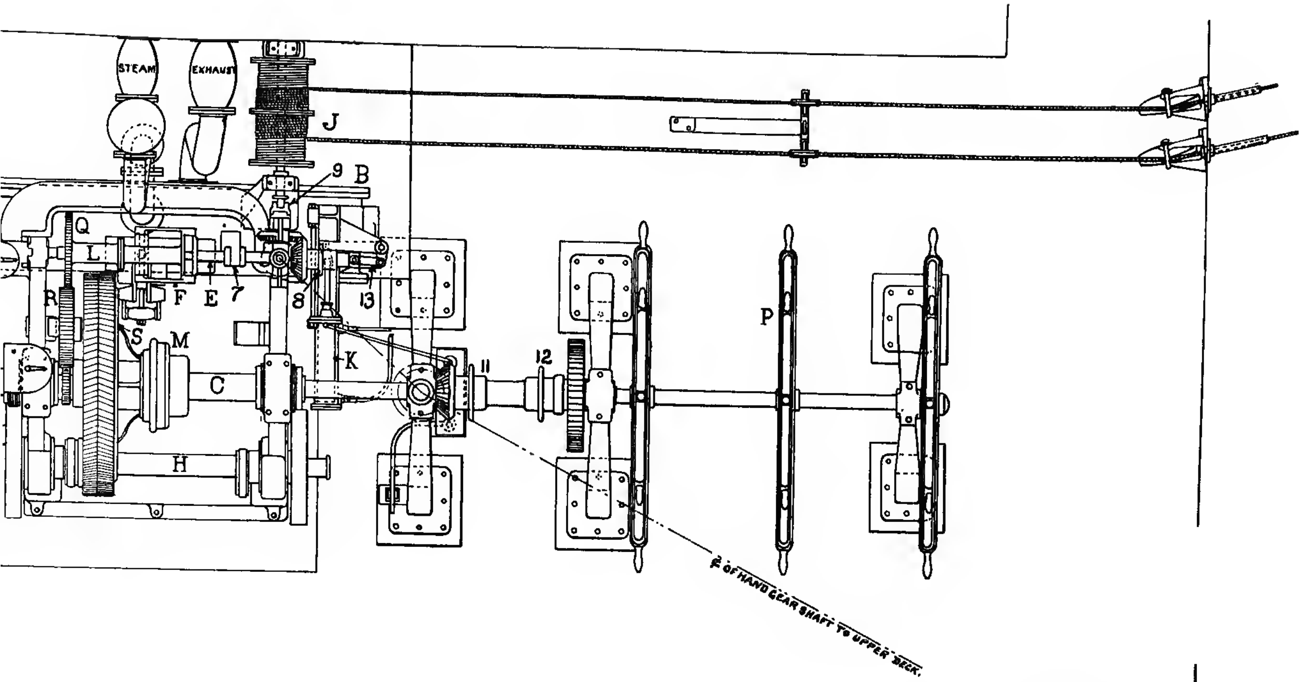


DETAIL OF LOCK PLATE

METHOD OF SECURING NUT


G
G
B

PLATES XXIX AND XXX.



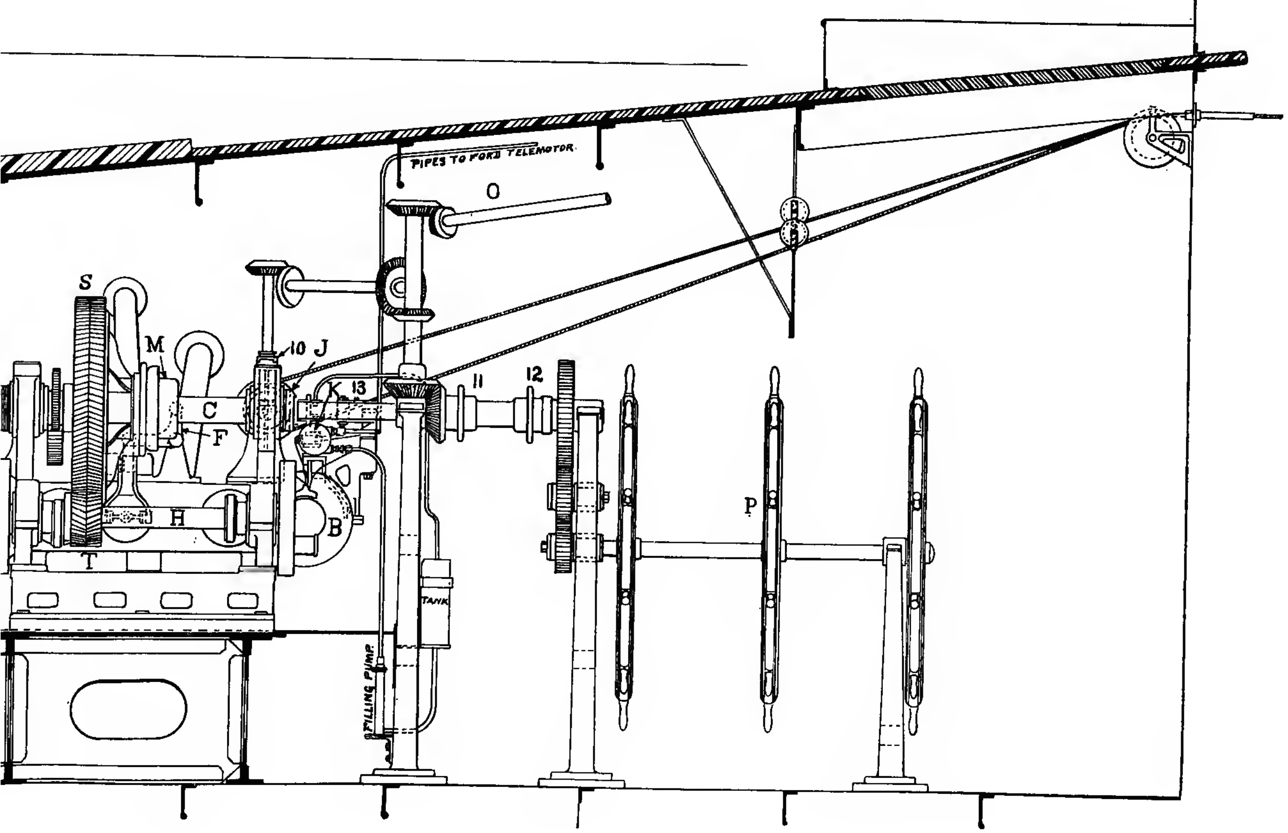


PLATE XXXI.

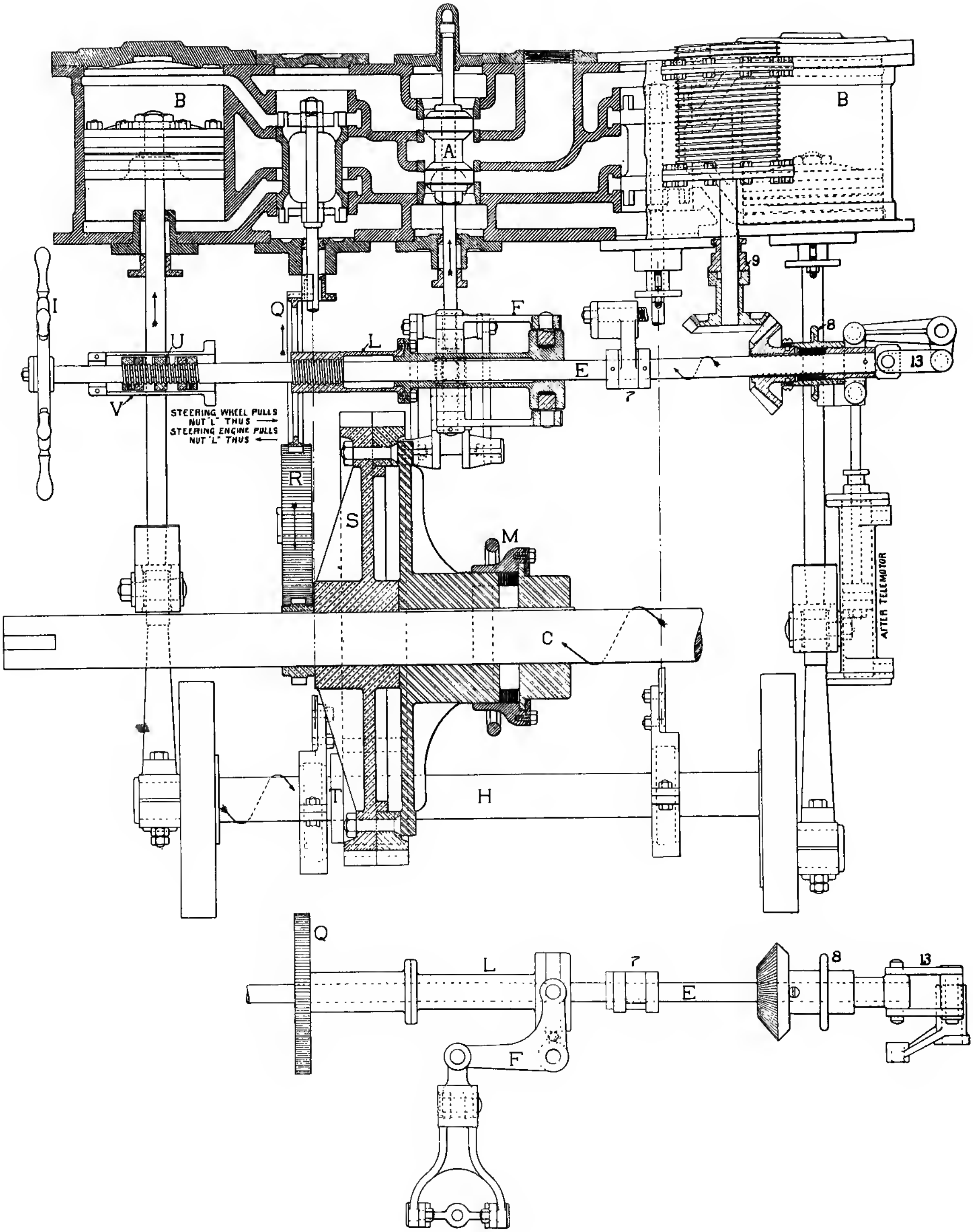
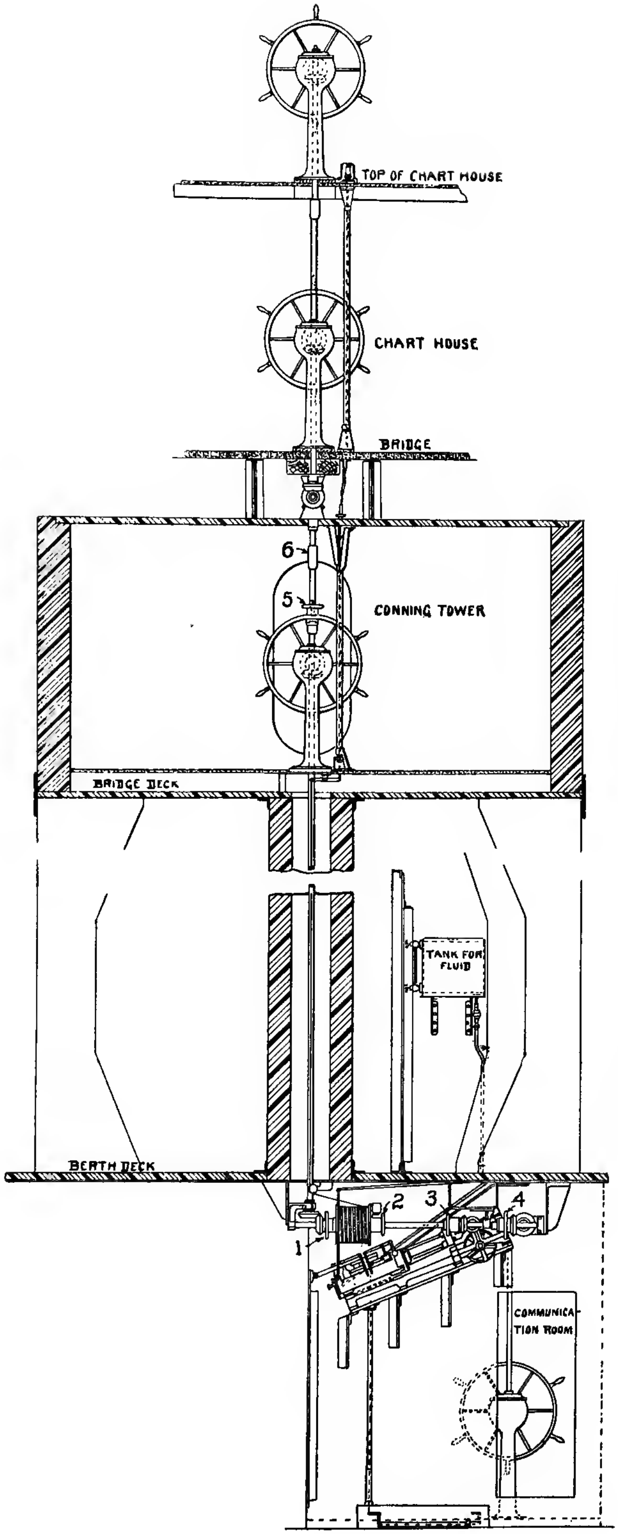

B
A
B
9
I
Q
F
U
L
8
E
7
13
V
STEERING WHEEL PULLS NUT "L" THUS →
STEERING ENGINE PULLS NUT "L" THUS ←
R
S
M
AFTER TELEMOTOR
C
T
H
Q
L
7
8
13
E
F

PLATE XXXII.


TOP OF CHART HOUSE
CHART HOUSE
BRIDGE
6
5
CONNING TOWER
BRIDGE DECK
TANK FOR FLUID
BERTH DECK
1
2
3
4
COMMUNICATION ROOM

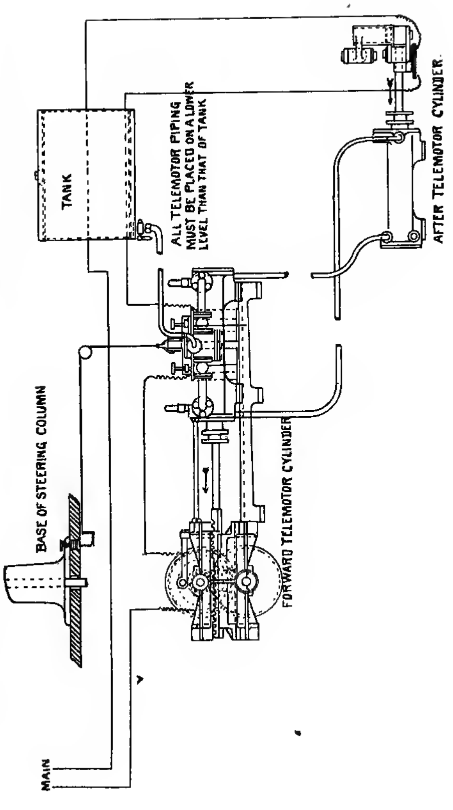
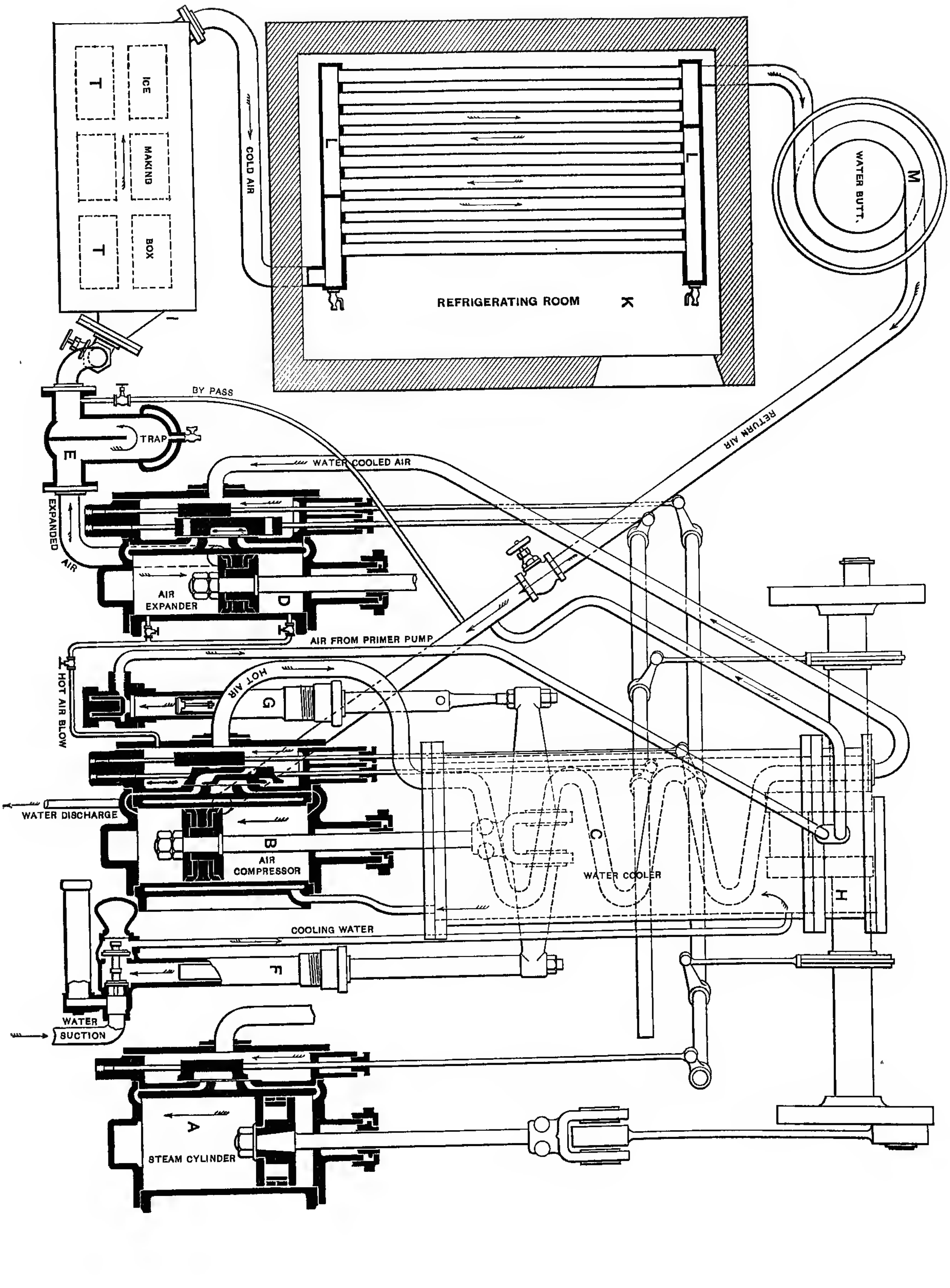
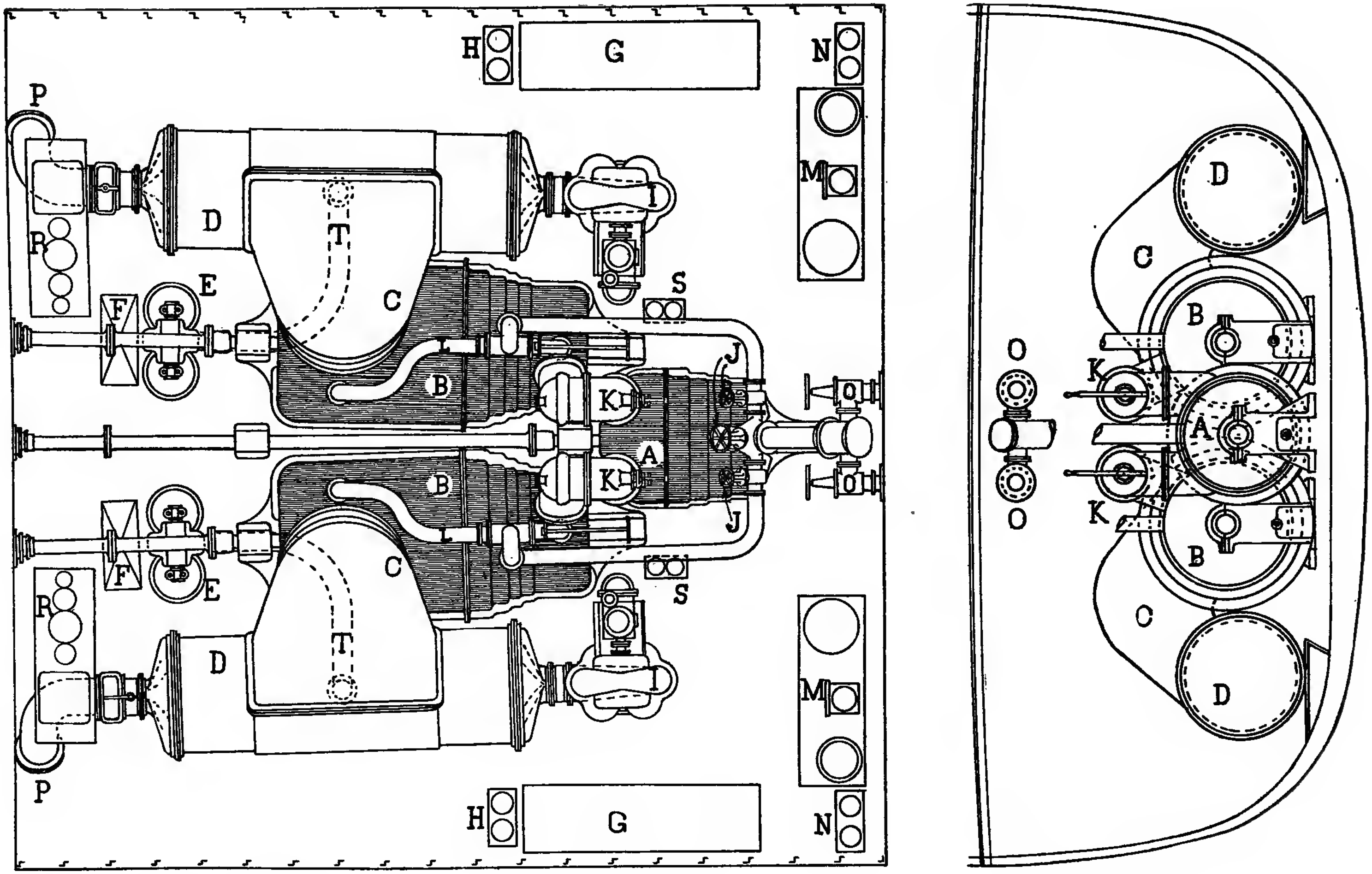
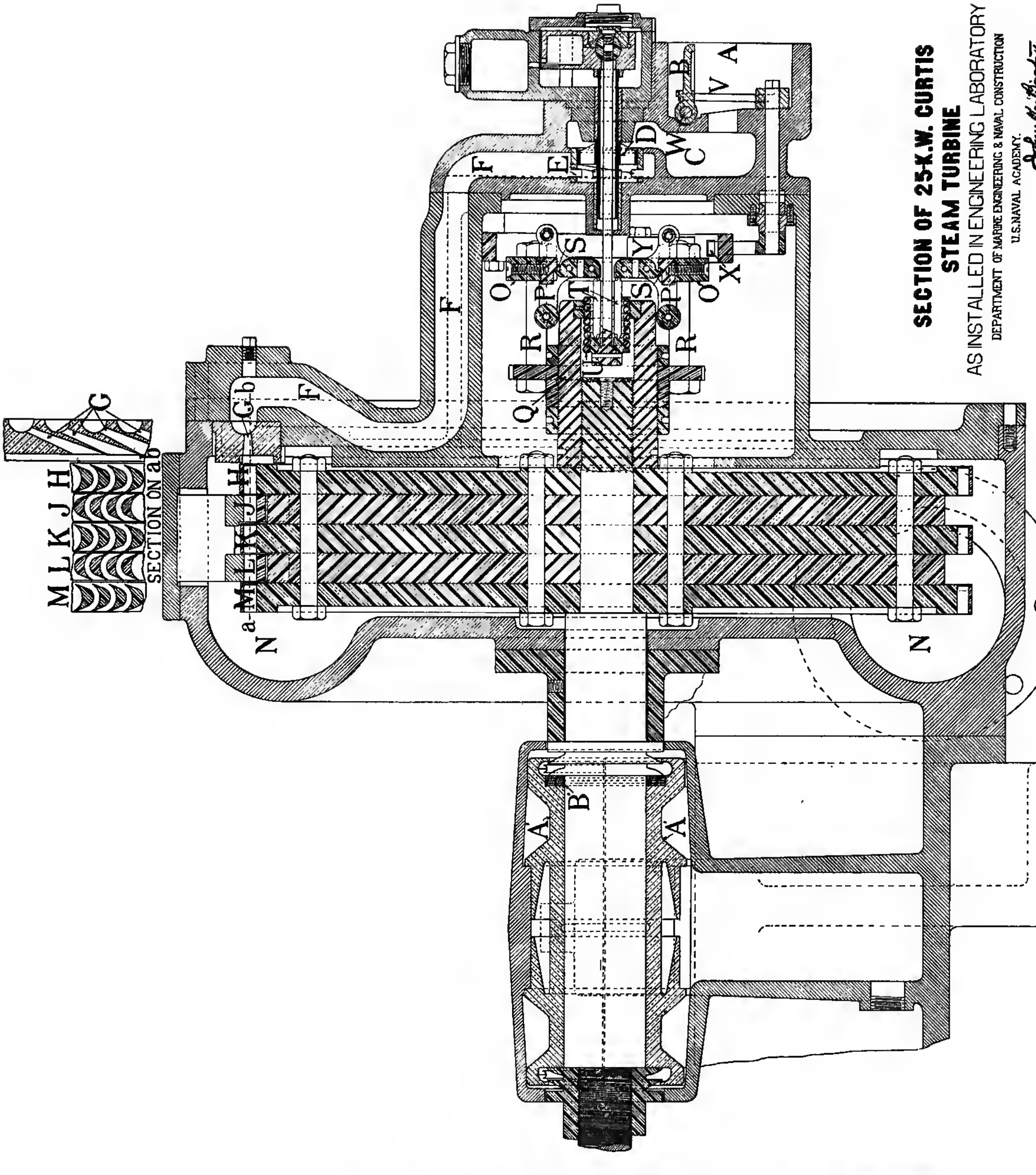

TANK
ALL TELEMOTOR PIPING MUST BE PLACED ON A LOWER LEVEL THAN THAT OF TANK
AFTER TELEMOTOR CYLINDER
BASE OF STEERING COLUMN
FORWARD TELEMOTOR CYLINDER
MAIN

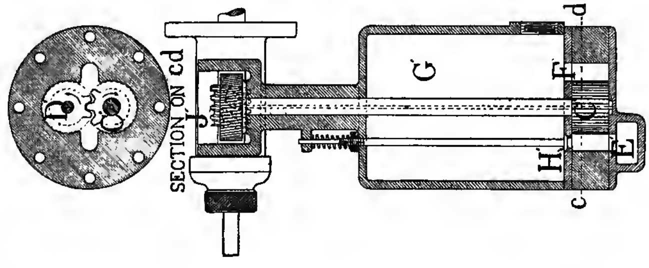
PLATE XXXIII.





A.	High pressure turbine.
B-B.	Low pressure turbines.
C-C.	Exhaust passages to condenser.
D-D.	Condensers.
E-E.	Air pumps.
F-F.	Hot wells.
G-G.	Feed tanks.
H-H.	Hot well pumps.
I-I.	Circulating pumps.
J-J.	Controlling valves.
K-K.	Self-closing valves.
L-L.	Steam to reversing turbine.
M-M.	Evaporating plant.
N-N.	Bilge pumps.
O-O.	Engine room stop valves.
P-P.	Outboard discharge.
R-R.	Dynamos.
S-S.	Oil pumps.
T-T.	Air pump suction.





SECTION OF 25-K.W. CURTIS STEAM TURBINE

AS INSTALLED IN ENGINEERING LABORATORY
DEPARTMENT OF MARINE ENGINEERING & NAVAL CONSTRUCTION
U.S.NAVAL ACADEMY.

John K. Barton
COMMANDER, U.S.N.
HEAD OF DEPARTMENT.